[Part 5. Reprinted 1958]

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XVII MAY 1938

BOSHART (K.). **Ueber Stickstoffdüngung im Gemüsebau.** [On nitrogenous manuring in vegetable cultivation.]—*Obst- u. Gemüseb.*, lxxxiii, 12, pp. 166–169, 3 figs., 1937.

In connexion with an experimental study conducted concurrently in the Munich district and other parts of Bavaria of the properties of nitrogen as a fertilizer for different vegetables, the writer mentions the valuable effects of this element in all the forms tested—ammonium chloride, ammonium sulphate, sodium nitrate, Leuna nitrate, urea, and calcium cyanamide—in combating leaf spot of celery (*Septoria apii*) [*R.A.M.*, xv, p. 275].

SCHULTZ (H.). **Zur Biologie der Bremia lactucae Regel, des Erregers des falschen Mehltaus des Salats.** [Contribution to the biology of *Bremia lactucae* Regel, the agent of downy mildew of Lettuce.]—*Phytopath. Z.*, x, 5, pp. 490–503, 7 figs., 3 graphs, 1937.

Five- to sixty-day-old sporangia of *Bremia lactucae*, the agent of downy mildew of lettuce in Germany and other European countries, germinate at a temperature range of 1° to 19° C., with an optimum at 10°, the corresponding figure for the same organs when one day old being 1° to 2°. They are fairly resistant to atmospheric desiccation, germinating to the extent of 18 per cent. after 16 hours in air maintained at 16 per cent. relative humidity. The sporangia germinate more freely and hyphal development is more rapid on lettuce leaves than in pure water. Infection takes place by means of stomatal penetration by the germ-tubes, the optimum temperature for this process being 15° to 17° in an atmosphere saturated with moisture for at least five to seven hours. The mycelium spreads intercellularly through the host tissues, the hyphae sending numerous haustoria into the cells. The fructification of the fungus takes place in a moisture-saturated atmosphere at 15° to 17° eight to nine days after infection, the incubation period being one or two days longer in the Maikönig variety than in Kaiser Treib. The control of downy mildew should be based in the first instance on the avoidance of the excessively damp conditions promoting the rapid and abundant development of the fungus.

Brown (J. G.). **Relation of livestock to the control of sclerotinosis of Lettuce.**—*Phytopathology*, xxvii, 11, pp. 1045–1050, 1 fig., 1937.

Livestock may prove either harmful or beneficial in relation to the control of *Sclerotinia sclerotiorum* on lettuce in Arizona [*R.A.M.*, xvi, p. 13], according to the manner of feeding. Farm animals, fed on infected lettuce refuse in corrals and farmyards, aid in the dissemination of the disease, whereas an appreciable degree of control may be effected by the pasturage of stock, especially sheep, on infected plants after harvest, and by quarantining the animals for four days, the maximum period for the evacuation of the living sclerotia. Sheep digested from 95 to 99·5 per cent. of the sclerotia eaten, and evacuated in a whole condition an average of 1·6 per cent. of which less than 1 per cent. were capable of growth.

Luyet's vital stain gave excellent results in the determination of sclerotial viability in *S. sclerotiorum*.

Cook (H. T.). **Watermelon wilt and resistant varieties for its control.**—*Bull. Va Truck Exp. Sta.* 97, pp. 1513–1526, 11 figs., 1937.

A description is given of the symptoms of watermelon wilt (*Fusarium bulbigenum* var. *niveum*) which has been reported in Virginia [*R.A.M.*, xvi, p. 85] since 1918, but suddenly became destructive in 1933, and has since spread with great rapidity in the State. The fungus prefers high temperatures (75° to 90° F.) but will grow at from 47° to 95°, temperatures of 61° to 65° being especially conducive to seedling decay. Abundance of organic matter in the soil favours the survival of the fungus which has been known to persist for 16 years in the absence of its host crop. Tests conducted during the last four years have shown that various wilt-resistant varieties are satisfactory for use in Virginia. Of these the Hawkesbury Wilt Resistant (developed in New South Wales) [see below, p. 298], Leesburg, and Wilt Resistant Klondike are the most promising, and their characteristics are briefly described.

Reyes (G. M.). **Sclerotium wilt of Peanut, with special reference to varietal resistance.**—*Philipp. J. Agric.*, viii, 3, pp. 245–287, 22 pl., 5 figs., 1937.

Wilt disease of the groundnut due to *Sclerotium rolfsii* [*R.A.M.*, xv, p. 325] is stated to cause considerable injury in the Philippines, where the fungus attacks the stems and crown roots near ground-level, causing the stem to shrink and die and the foliage to wilt. The underground parts may also be affected, resulting in the rotting of the gynophores, pods, and roots. Infection is most severe during the wet season. The pathogenicity of *S. rolfsii* was established by inoculation experiments; infection of the young plant usually results in death, while plants infected at maturity give a greatly reduced yield. The fungus was observed attacking cassava, cowpea, and mango in the Philippines for the first time, while the total hosts affected number 54. In experiments on varietal susceptibility, from 31·3 to 50·7 per cent. of the plants were wilted. The most resistant varieties were the late maturing Virginia Jumbo (a), Virginia Jumbo, and Tai-tau (all of which the author recommends also as heavy yielders and producing large kernels with good dormancy quality), followed by Tirik, Vigan Lupog, San

José No. 3, Cagayan No. 1, Büt, Spanish, White Improved Spanish, Georgia Red, Macapno, and Valencia. Although no consistent results have been obtained, yet a definite relation between the number of diseased and germinated pods to infection has been observed. Runner types are more resistant than the erect or semi-erect varieties, and it may be possible to breed hybrids possessing desirable crop characters combined with disease resistance.

MORQUER (R.). **Études biologiques sur les associations fongiques. Coexistence de champignons viticoles sur le même hôte. Hypocréacées.** [Biological studies on fungal associations. Coexistence of viticolous fungi on the same host. Hypocreaceae.]—*Rev. gén. Bot.*, xlix, 585, pp. 558–594; 586, pp. 619–636, 24 figs., 1937.

In the second part of this paper the author gives a detailed description of his studies in pure culture of two fungi isolated by him from diseased vine branches from Bulgaria, which were sent to him by L. Rives in 1932. One of these organisms is considered to be new to science and is named *Acrostalagmus ampelinus* [without a Latin diagnosis], and the other is identified as a biological form of *Fusarium vasinfectum*. The pathogenicity of these two fungi has not been tested.

VIDAL (J.-L.). **Suites d'expériences contre la chlorose.** [Further experiments on the control of chlorosis.]—*Rev. Vitic., Paris*, lxxxvii, 2263, pp. 370–371, 1937.

In continuation of his studies on the control of vine chlorosis [*R.A.M.*, xvi, p. 366] the author gives tabulated data on the effect of ten different treatments on the yield of originally affected stocks in 1936 and 1937. The highest yield for the two years together was obtained from plots treated in 1935 and 1936 with iron sulphate (25 per cent.) and citric acid (6 per cent.), and that for 1937 from vine stocks swabbed in 1935 with iron nitrate (20 per cent.) and with the iron sulphate and citric acid mixture in 1936. These results confirm the markedly beneficial role of citric acid in the treatment of the disorder. The iron sulphate-citric acid mixture should be prepared one or two days before use, whereas the iron sulphate solution alone should be used immediately after preparation.

MARSAIS (P.). **Le court-noué parasitaire de la Vigne.** [Parasitic court-noué of the Vine.]—*C. R. Acad. Agric. Fr.*, xxiii, 30, pp. 954–960, 1937.

This is a brief survey of some recent developments in the study of parasitic court-noué of the vine (*Pumilus medullae*) [*R.A.M.*, xvii, p. 159] in various countries, including Austria, Germany, Yugoslavia, and Czechoslovakia. Most of the work referred to has been noticed in this *Review*, but the following observation by Mohorčič in Yugoslavia may be mentioned. The invasion of the pith by *P. medullae* entails a loss of the natural permeability of the cells, which are no longer able to carry out normally their work of distribution of the nutrient elements; the tendrils, deprived of their essential phosphorus, cease growth, and the foliar system suffers. The movement of potassium, another important element in tissue development [ibid., xvi, p. 794], is also impeded,

while the abundant lime salts of the pith membranes are prevented from exercising their normal stabilizing action on the cells.

MÜLLER (K.). **Entwicklung der Reben-Peronosporabekämpfung in Baden.** [The development of Vine *Peronospora* control in Baden.] —*NachrBl. dtsch. PflSchDienst*, xii, 4, pp. 195–205, 7 figs., 1938. [English, French, and Spanish summaries on pp. 343, 345–346, 348.]

Meteorological conditions in Baden (i.e., excessive precipitation in the Black Forest) are stated to be particularly conducive to the epidemic development of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] which during the period from 1907 to 1916 was responsible for a reduction of 33 per cent. of the total vine-growing area of the province. The Gutedel variety suffered the heaviest damage, being largely defoliated by the middle of August and yielding nothing but shrivelled berries at harvest time. Highly satisfactory control has been secured with nosprasen and nosprasen neutral (the latter requiring no additional lime), as well as with the standard Bordeaux mixture. In this connexion the writer emphasizes the great advantages of the 'incubation calendar' method of forecasting attacks of *P. viticola* [*R.A.M.*, xvi, p. 654], by means of which the correct spraying times have been publicly announced for the last 25 years. The economic returns from timely fungicidal applications are reflected in the average increase of yield from the Baden vineyards of 135 per cent. in the last 19 years.

STAUDERMANN (W.). **Methodisches zur Prüfung von Mitteln auf ihre Peronosporawirkung.** [Methods of testing preparations for their action against *Peronospora*.]—*NachrBl. dtsch. PflSchDienst*, xii, 4, pp. 205–217, 12 figs., 1937. [English, French, and Spanish summaries on pp. 344, 346, 349.]

In the autumn of 1932 the writer began to develop a laboratory method, applicable throughout the year, of testing disinfectants for their action against vine downy mildew (*Peronospora*) [*Plasmopara viticola*: *R.A.M.*, xvii, p. 52, and preceding abstract]. Plants of the susceptible Sylvaner variety, grown in pots, are inoculated once a week, stored for three hours in a damp room, and then transferred to a hothouse for the incubation period of the fungus. During the night from the sixth to the seventh day the plants are again exposed to infection in a moist chamber. The fungicides are tested for their prophylactic action, effects on a conidial suspension of *P. viticola*, adherence to the foliage (for the determination of which a special apparatus has been constructed), and efficacy after infection. In conclusion, the method of estimating the relative value of the different preparations (by accurate counts of the number of leaf infections) is described and its practical bearings discussed.

VANDERWALLE (R.). **Notes phytopathologiques.** [Phytopathological notes.]—*Bull. Inst. agron. Gembloux*, vi, 3–4, pp. 191–195, 2 figs., 1937. [Flemish, German, and English summaries.]

In July, 1936, chicory growing in Belgium developed a leaf spot followed by the gradual destruction of all the aerial parts, the roots

at harvest time being smaller than those of healthy plants, and showing, when cut, a brown discoloration at the collar. Under forcing conditions the affected roots rotted subsequently in the silo.

Isolations from affected leaves yielded a species of *Alternaria* in association with a species of *Phoma*; the latter was shown by inoculations to be parasitic. The spherical, non-ostiolate pycnidia measured 90 to 110 μ in diameter and the oblong pycnospores 5 to 7·5 by 2 to 2·5 μ. Inoculations of chicory plants with this fungus gave oily, transparent lesions on the leaves, quickly spreading along the veins, and, on young leaves, quickly turning brown and falling out. The root vessels turned brown, but showed no structural alteration. When cultivated under forcing conditions the inoculated plants showed inferior foliage development to the controls but were otherwise normal, and it is considered that the losses experienced by growers were probably due to the weakened condition of the plants and subsequent infection by *Sclerotinia libertiana* [*S. sclerotiorum*].

Inoculations of white grapes with *Botrytis cinerea* isolated from brownish spots beneath the epidermis of other fully grown white grapes reproduced the condition when the berries were wounded and kept for a few days at 25° C. Inoculations of unwounded berries gave negative results. The lesions continued to develop during cold storage, and the weakening of the epidermis allowed the juice to emerge, with rapid development of saprophytes. In nature, infection probably takes place following insect punctures and mechanical injury.

Report of the Latvian Institute of Plant Protection for 1936–37.—Latvian Chamber of Agriculture, pp. 67–83, 1937. [Latvian, with English summary.]

In a list of the most important plant diseases observed in Latvia during 1936 the following new records are mentioned: *Puccinia asparagi* on asparagus, and *Pseudoperonospora cannabina* [*R.A.M.*, xvi, p. 749] and *Diplodina cannabicola* Pet. on hemp.

Ceresan (100 gm. per 50 kg. seed-grain) gave the highest increase of yield in rye treated by H. Eglits with various preparations for the elimination of *Fusarium* spp. The same worker reduced the incidence of *Rhizoctonia* [*Corticium solani*] on potato tubers by 2½ times as compared with the untreated controls by treatment with aretan [ibid., xv, p. 74].

PARK (M.) **Report on the work of the Mycological Division.**—*Adm. Rep. Dir. Agric., Ceylon, 1936*, pp. D28–D35, 1937.

Plant disease investigations in Ceylon in 1936 demonstrated that in *Hevea* rubber areas undergoing rejuvenation the cutting out of trees stimulates the activity of root parasites, especially *Fomes lignosus* [*R.A.M.*, xvii, p. 202]. All roots should therefore be completely removed, even if the disease is quiescent.

Rice from Mannar and the Jaffna Peninsula was affected by the disease known locally as 'senthal'. Affected plants develop a pinkish, tubular shoot, followed by the suppression of further growth. Tillering is stimulated under favourable growth conditions. The condition is found chiefly on sandy soils, especially those given heavy dressings of

bulky green manures which have incompletely decayed. It is also associated with excessive drying of the fields at an early period of growth, and occurs only in localities exposed to the south-west winds. It does not develop when the young plants have received sufficient water.

The leaf-miner *Phyllocnystis citrella* was found to be an important agent in the spread of citrus canker [*Pseudomonas citri*: ibid., xvi, p. 153]. None of the fungicides tested has given more than partial control of this disease. The evidence obtained showed that heavy picking of diseased leaves should not be undertaken at the beginning of a dry period, as this may induce sun cracking; the best time in a semi-dry area is with the first showers after a dry spell, just before the new burst of foliage develops. There appears to be a negative correlation between rainfall and leaf-miner epidemics, and a positive one between canker incidence and rainfall.

When five sweet orange, mandarin orange, and lime trees severely affected with mottle leaf [ibid., xvii, p. 105] were sprayed with 1 gall. each of a mixture of ½ lb. zinc sulphate and ½ lb. hydrated lime, in 5 galls. water, with a neutral spreader, marked improvement took place.

The spraying of tobacco nursery seedlings with colloidal copper markedly reduced damping-off (*Pythium* sp.) [ibid., xvi, p. 566] and also the amount of frog-eye [*Cercospora nicotianae*: ibid., xvi, p. 713] developing after transplanting; the evidence indicated that the frog-eye was caused by infection from the soil.

Surat ginger imported from India and planted in the central and south-western divisions of Ceylon developed a soft rot caused by *P. myriotylum* [ibid., xiv, p. 473], which inoculations in the laboratory showed to be an active parasite on all varieties of ginger, though it was not found on any ginger except that imported from India. All the Surat plants were at once destroyed, except in one area where the ginger was closely watched, each of the diseased plants being uprooted and destroyed and the soil disinfected. The number of plants so removed was found to diminish steadily, few new infections appearing by the time the crop was fully grown. The local species responsible for ginger soft rot is probably *P. complectens* [cf. ibid., xv, pp. 137, 632]. More than one species of *Pythium* may be responsible for the disease in India.

Other new diseases recorded included *Ustulina zonata* causing collar rot of sweet orange, *Rosellinia bunodes* causing root disease of *Artocarpus integer* and *Hevea* rubber, *Fomes noxius* causing brown root disease of *Bombax malabaricum*, pink disease (*Corticium salmonicolor*) of grapefruit [ibid., xiv, p. 627], root disease (*F. lignosus*) of *Crotalaria anagyroides*, dahlia powdery mildew (*Oidium* sp.) and leaf disease (*Entyloma dahliae*) [ibid., xvi, p. 464], stem disease of *Dianthus barbatus* caused by *Sclerotium rolfsii*, collar and rhizome disease (*Rhizoctonia* [*Corticium*] *solani*) of *Elettaria cardamomum*, leaf spot (*Piricularia oryzae*) of *Eleusine coracana*, leaf disease (*Septoria* sp.) of *Gerbera jamesonii*, tomato fruit rot (*Oospora lactis parasitica*) [ibid., xiii, pp. 288, 547], rice foot rot (? *Cephalosporium* sp.), pod disease (*Cercospora sesami*) of gingelly [*Sesamum orientale*], and nasturtium [*Tropaeolum*] root and stem disease (*Corticium solani*).

SHEPHERD (E. F. S.). **A revised list of plant diseases occurring in Mauritius.**—*Bull. Dep. Agric. Mauritius* (Sci. Ser.) 23, 14 pp., 1937.

This is a revised annotated list, arranged in alphabetical order of hosts, of the bacterial, fungous, virus, and physiological diseases of plants occurring in Mauritius [*R.A.M.*, xii, p. 115].

VENKATARAYAN (S. V.). **Report of work done in the Mycological Section during the year 1935–1936.**—*Adm. Rep. agric. Dep. Mysore, 1935–6*, pp. 51–55, 1937.

Koleroga disease [*Phytophthora arecae*: *R.A.M.*, xv, p. 77] of areca palm [*Areca catechu*] is stated to be spreading gradually from west to east in Mysore, and depots for the sale of sprayers and chemicals are being closed down in localities where they are no longer required and opened up in the new areas where the disease has appeared. 'Hidimundige roga' [loc. cit.] or 'narrow crown disease', of the same host, which is becoming more frequent and widespread, greatly resembles the West Indian coco-nut little leaf [ibid., xv, pp. 2, 128].

'Katte' disease of cardamoms [*Elettaria cardamomum*], stated to be due to a species of *Coniothyrium* [cf. ibid., iv, p. 110; xvi, p. 154] caused about 70 per cent. loss among nursery seedlings.

A rice disease known locally as 'karikaddi roga' and stated to be due to a species of *Ephelis* has markedly increased in recent years in Mysore and Shimoga. The condition appears when the earheads begin to form and causes a reduction of yield. In culture, the fungus grows very slowly, sporulating freely.

A strain of *Piricularia* from ragi [*Eleusine coracana*] earheads was found in culture to show a prominent grey colour in the mycelium and spores, and to form dark chlamydospores.

Wet rot of tobacco nursery seedlings due to *Pythium aphanidermatum* [ibid., xv, p. 2] was arrested by the prompt removal of the diseased plants and spraying the remainder with 1 per cent. Bordeaux mixture, the same spray application also controlling *Cercospora* leaf spots. In the field, powdery mildew (*Erysiphe cichoracearum*) occurred in nearly all the tobacco plots, but was checked by the removal of the basal leaves and spraying with Bordeaux mixture.

Apple mildew [*Podosphaera leucotricha*] was controlled by spraying with groundnut oil Bordeaux mixture, which (at a concentration of 1 per cent.) also gave good control of vine downy mildew [*Plasmopara viticola*].

HANSFORD (C. G.). **Annual Report of the Plant Pathologist, 1936.**—*Rep. Dep. Agric. Uganda, 1936–37* (Part II), pp. 43–49, 1938.

During 1936 it was ascertained that the most important cause of cotton wilt in Uganda [cf. *R.A.M.*, xvi, p. 234] is *Verticillium dahliae* [ibid., xvii, p. 240]. Though not before recorded from the Protectorate, this fungus was isolated from over 90 per cent. of the diseased cotton samples examined early in the 1936–7 season. Inoculations of cotton plants with the organism gave typical symptoms of wilt. It is impossible to distinguish between the symptoms of *V. dahliae* and those caused by *Fusarium* spp. [loc. cit.] in the field, and when both are present in the wood, *V. dahliae* often becomes overgrown by *Fusarium*.

No cotton variety grown locally is completely resistant, and three wilt-resistant varieties from the United States showed infection. One group of varieties grown locally reacts to infection by shedding the larger leaves but retaining the bolls, which ripen in the usual way, and developing a second flush of leaves. In 1936 these varieties (though infected) produced a satisfactory crop, and it may prove possible to breed varieties of this tolerant type which will produce good crops in spite of infection. The external and internal symptoms of *Macrophomina phaseoli* on cotton [ibid., xvi, pp. 249, 672] are sometimes very difficult to distinguish from wilt. *V. dahliae* was also isolated from wilted plants of *Abroma augusta*, cassava, simsim [*Sesamum orientale*], and a native species of *Triumfetta*. That the fungus is indigenous was shown by the fact that cotton seed from wilt-free plants sown in land not previously planted to cotton gave 59 per cent. infection, while a neighbouring plot of *A. augusta* showed about 5 per cent. infection.

Infection of cassava by *V. dahliae* has hitherto been observed only at Bukalasa, where it developed on land where cotton had been infected two years before the cassava was planted. Inoculation tests showed the 'bitamsi' variety to be comparatively resistant.

Two cases of tobacco wilt caused by a *Fusarium* of the *elegans* group and thought to be *F. oxysporum* var. *nicotianae* [ibid., xvi, p. 658] were noted for the first time. Tobacco at Bukalasa also developed hollow stem (*Bacterium* [*Erwinia*] *aroideae*) [ibid., xvi, p. 841].

S. orientale is widely affected by two leaf spot diseases, previously confused. One, due to *Cercospora sesami* [ibid., xii, p. 422], appears as small, generally round, papery, white to yellowish-brown spots on both surfaces, while the other, due to *Cylindrosporium sesami* n.sp. [with a Latin diagnosis], appears as more diffuse, irregularly angular to round, sometimes indistinctly zonate, dark reddish-brown spots 2 to 5 mm. in diameter, with a raised margin, often becoming confluent, especially round the edges of the more mature leaves. Infection by the latter fungus often spreads to the young leaves at the top of the plant, and severe infection may cause heavy loss. The same host was also affected by two bacterial rots, one causing a dark red rot of the interior of the stem, and the other a water-soaked, dark green rot.

Some cassava varieties were widely affected by *Bact. cassavae* n.sp., producing dark green, water-soaked, angular leaf spots 1 to 2 mm. in diameter, especially on the lower surface. The older spots became confluent, and were often arranged in irregular lines along the main veins, though they often developed round the edges of the spots caused by *Cercospora cassavae* [*C. henningsii*] [ibid., xv, p. 280]. On very susceptible varieties complete ringing at the original site of infection was followed by the death of the distal parts. In culture, the bacteria (inoculations with which into young cassava shoots gave typical symptoms) formed very short, Gram-negative, non-alcohol- or acid-fast rods with a few peritrichiate flagella; agar colonies were round, smooth, lens-shaped with entire edges, translucent, yellow, and of uniform structure.

P.O.J. 2822 sugar-cane was severely affected by mosaic, and should be abandoned. Scattered individual stools of P.O.J. 2725 and P.O.J. 2878 developed a dry basal rot caused by a species of *Marasmius* and

corresponding to the 'acute' form of *Marasmius* root rot found in the West Indies [ibid., xv, p. 465].

A bacterium, apparently *Bact. phaseoli*, was isolated from water-soaked leaf spots on beans [*Phaseolus* sp.].

Tephrosia candida showed minute, white, later raised, corky lesions on the leaves, petioles, branches, and inflorescences caused by *Elsinoe tephrosiae* n.sp. [with a Latin diagnosis]; these were not in themselves harmful, but were invaded by other organisms, including *Cladosporium herbarum* and *Fusarium*, which rotted the bark round the original lesion and killed the wood of the branch. Attack on the main stem was followed by the death of the whole plant. The fungus has asci 18 to 23 μ in diameter and oblong-elliptical, 3- to 4-septate ascospores measuring 13 to 15 by 6 to 7 μ, constricted at the middle septum and also showing one longitudinal septum.

Various species of *Fusarium*, including forms belonging to *Hypomyces ipomoeae* [ibid., xv, p. 343], *Lisea*, and *Gibberella* were isolated from pigeon pea plants which had died off from the top downwards; the *Gibberella* species appeared to be the primary parasites. The disease is distinct from the wilt reported from India as due to *F.* [*vasinfectum*: ibid., xvi, p. 151].

The common leaf spot of *Hibiscus rosa-sinensis* was identified as due to *Bact. hibisci* [ibid., ii, p. 413]; a different, as yet unidentified, bacterium was isolated from a fruit rot of *H. esculentus*.

MACKIE (J. R.). **Annual Report on the Agricultural Department, Nigeria, 1936.**—43 pp., 1937.

Experiments have conclusively proved that cacao black pod [*Phytophthora palmivora*: *R.A.M.*, xvi, p. 660] can be kept under control in the south-western provinces of Nigeria by measures which any native farmer can carry out, namely, the regular harvesting of all ripe pods at intervals of three to four weeks during the fruiting season, the removal of all dead wood after the trees have flushed in April, and of all dead pods, which can be left on the ground.

Cassava mosaic [ibid., xvii, p. 94] has now spread northwards from the coast to Ilorin. Resistant varieties have been imported, and some strains have been developed which, so far as tested, appear to be highly resistant to the disease.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlviii, 12, pp. 683–687, 6 figs., 1937.

Brief popular notes are given on the following plant diseases found in New South Wales, viz., black end of pear [*R.A.M.*, xv, p. 729] (by W. A. Birmingham), *Bacterium campestre* [*Pseudomonas campestris*: ibid., xvi, p. 721] and *Phoma lingam* [ibid., xvi, p. 493] on cabbages and cauliflowers, blossom-end rot of tomatoes [ibid., xvii, pp. 212, 216], and aster wilt (*Fusarium conglutinans* [var.] *callistephi*) [ibid., xvii, p. 247].

Black end is confined locally to a few pear fruits on individual William trees and appears to be most pronounced on soils that dry out quickly. The available evidence indicates that the rootstock *Pyrus serotina* is responsible for the condition, the Kieffer and *P. ussuriensis*

stocks also being to some extent conducive to the disease. Black end does not occur on varieties worked on *P. communis*. There is no indication that the disease spreads from tree to tree; the same percentage of fruits are affected from year to year, the development of black end fruits sometimes increasing in rapidity two to three months after blossoming. Complete ringing of the stock with a chisel gave perfect control after one or two seasons.

The method of hot-water seed treatment recommended against *Bact. campestre* and *P. lingam* consists in suspending the seed in cheesecloth bags in 3 or 4 galls. water kept constantly at 122° F. for 18 mins. for cauliflower and 25 mins. for cabbage and turnip seed.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlix, 1, pp. 17–21, 7 figs., 1938.

In these notes it is stated that some years ago a few vines of a watermelon being grown in New South Wales under the name of 'Grey Monarch', which has white seeds and is susceptible to *Fusarium* [*bulbigenum* var.] *niveum* [*R.A.M.*, xvi, p. 439], gave melons with dark seeds resistant to the disease. Investigations confirmed the resistance of this type of melon, which has been named 'Hawkesbury Wilt Resistant' [see above, p. 290], and demonstrated that it has good commercial qualities. Susceptible melons can be grown in uncontaminated or new soil, provided the seed is disinfected by 5 to 10 minutes' immersion in mercuric chloride solution (1 in 1,000).

In moist, warm conditions considerable damage is frequently caused to snapdragons [*Antirrhinum majus*] in New South Wales by anthracnose (*Colletotrichum antirrhini*), which on the leaves and stems of plants of all ages produces sunken, oval or circular, yellowish-green to dull white spots with a narrow, brown border. Control consists in raising the seedlings in clean seed-beds and spraying periodically with Bordeaux mixture (4–4–50).

Martyn (E. B.). **Report on the Botanical and Mycological Division for the year 1936.**—*Div. Rep. Dep. Agric. Brit. Guiana, 1936*, pp. 77–81, 1938.

This report [cf. *R.A.M.*, xvi, p. 155] contains the following items of interest. A small outbreak of top rot of sugar-cane [ibid., v, p. 345; xii, p. 787] occurred on D. 625 on the East Coast at the end of the mid-year rains in August. The affected plants recovered after two irrigations.

Coffee leaves from the west coast of Demerara, apparently infected with *Corticium koleroga* [ibid., xi, p. 431], were received in January. *Sporotrichum citri* [*Elsinoe fawcetti*: see below, p. 312] was observed on a plant of Sampson tangelo [tangerine × pomelo] in the north-west district [ibid., xv, p. 202]. *Aschersonia cubensis*, associated with a Lecaniid scale, occurred on grapefruit leaves in the West Bank district of Demerara. In the same district a recurrence of witches' broom [*Marasmius perniciosus*: loc. cit.] was found in August on a cacao tree, which had apparently been free from it for some time and had been heavily pruned earlier in the year. In July the occurrence of a wilt of nearly mature groundnuts, associated with a species of *Thielavia*, was reported from sub-station Cecilia.

SQUIBBS (F. L.). **Annual Report of the Department of Agriculture, Seychelles, 1936.**—30 pp., 1938.

On pp. 18–19 of this report the following fungi, identified at the Imperial Mycological Institute, are recorded as occurring in the Seychelles in 1936: *Phytophthora palmivora* [*R.A.M.*, xvi, p. 300] causing coco-nut heart and bud rot; *Himantia stellifera* [ibid., xvi, p. 774] on *Cymbopogon citratus*; and a non-septate mycelium resembling that of a *Phytophthora* or a *Pythium* on diseased stems of *Gramatophyllum speciosum*. Swellings at the crown of *Eucalyptus citriodora* seedlings were attributed to *Bacterium tumefaciens* and were in the form of paired tumours arising in the axils of the cotyledons, which in some cases had become united. A premature leaf fall of the same host was associated with leaf spots on which a species of *Phyllosticta* occurred.

BITANCOURT (A. A.). **Brazil: diseases of cultivated or useful plants, observed in the State of São Paulo.**—*Int. Bull. Pl. Prot.*, xi, 12, pp. 269–275, 1937.

A list is given of the fungal, bacterial, virus, physiological, and indeterminate diseases of economic and ornamental plants observed in São Paulo, Brazil, from 1931–36.

BITANCOURT (A. A.). **Relação das doenças e fungos parasitas observados na secção de phytopathologia durante os annos 1935 e 1936.** [Report on the diseases and parasitic fungi observed in the Phytopathological Section during the years 1935 and 1936.]—*Arch. Inst. biol. Def. agric. anim., S. Paulo*, viii, Suppl. 4, pp. 315–322, 1937.

The following are among the items of interest in this list of diseases found affecting cultivated plants in São Paulo, Brazil, during 1935 and 1936 [cf. *R.A.M.*, xv, p. 487, and preceding abstract]. Dwarf bananas (*Musa cavendishii*) were infected by 'squirter disease' (*Nigrospora*) [cf. ibid., xvii, p. 223]. Apples were attacked by *Corticium salmonicolor* [ibid., xv, p. 633] and *C. koleroga*, and pears by *Stilbum cinnabarinum* [*Megalonectria pseudotrichia*: ibid., xiv, p. 459]. Tomatoes exposed for sale bore pale-coloured, yellow or green, zonate, sometimes necrotic and sunken lesions reminiscent of those due to spotted wilt. *Claviceps paspali* was observed on *Paspalum dilatatum* [ibid., xvi, p. 753, and below, p. 326].

Annual Report of the Agricultural Experiment Station, Rio Piedras, Puerto Rico, 1935–36.—135 pp., 1937.

In the sections of this report dealing with botany and plant pathology (by M. T. Cook, pp. 39–46, and A. Roque, pp. 47–52) it is stated that during the period under review a severe epidemic of cucumber mosaic occurred in Porto Rico [*R.A.M.*, xvi, p. 114], several fields showing almost 100 per cent. infection, though previous examinations of cucumbers since 1923 have never shown more than an occasional diseased plant. The same host was also affected, for the first time, apparently, by bacterial fruit rot (*Bacterium lacrymans*) [ibid., xv, p. 553], which

caused very heavy losses during shipment. Dipping the fruits in disinfectants gave encouraging results.

Other new records for Porto Rico were anthracnose of grapes (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*: ibid., xvii, p. 17], blossom blight of zinnia, due to an undetermined cause, yautia [*Xanthosoma* sp.] tuber rot (*Bact. carotovorum*) [*Erwinia carotovora*], yam [*Dioscorea* sp.] mosaic, papaw(?) yellow mosaic, and downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) [ibid., xvi, p. 590] on Persian melons.

A new strain of tomato (LJX–7) has been developed which is more resistant to *Bact. solanacearum* than Marglobe. Derived from a cross between Louisiana Pink and a native, tolerant type (JX), it appears to be very well suited for the local market. A commercial variety of egg-plant resistant to *Bact. solanacearum* has also been developed.

Black tip of plantains [? *Helminthosporium torulosum*: ibid., xvii, p. 191] appears to be increasing. The pathogenicity of the fungus isolated from affected fruits was established, and effective control was given by one to three applications of Bordeaux mixture (3–3–50) during the emergence of the raceme and before fruit-setting. During the spraying trials the sprayed and unsprayed racemes were artificially inoculated after the applications were made, on the same day, and while none of the sprayed racemes became infected all the unsprayed ones later developed the disease. The virus-like rolling of the spindle of 'enano' plantains [ibid., xvi, p. 114] is the most important problem in the banana disease project.

Pineapple wilt, introduced on two different shipments from Hawaii [ibid., loc. cit.], was controlled by destroying the mealy-bugs and ants infesting the plants.

Lima beans [*Phaseolus lunatus*] were widely but not severely affected by *Nematospora phaseoli* [*N. coryli*], some of the pods being so deformed as to suggest insect injury.

Sugar-cane gummosis (*Phytomonas* [*Bact.*] *vasculorum*) has almost disappeared from the island, but occurs on Vieques and at Fajardo.

The cucumber strains 35–2, 100, 8–5, and 8–3–2 all showed high resistance to mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) and produced fruits without requiring to be sprayed.

Young cotton plants were attacked by an *Alternaria* spot, the disease disappearing as the plants developed. The organism, which appeared to be seed-borne, was found to be morphologically different from that causing a similar disease in Trinidad.

Verslag van den Directeur van het Algemeen Proefstation der A.V.R.O.S. over het tijdvak 1 Juli 1935—30 Juni 1936 en het tijdvak 1 Juli 1936—31 December 1936. [Report of the Director of the Avros General Experiment Station for the periods 1st July, 1935, to 30th June, 1936, and 1st July, 1936, to 31st December, 1936.]—*Meded. alg. Proefst. Avros*, Alg. Ser. 58, 44 pp., 1937.

The following are among the items of phytopathological interest in the botanical section of this report on matter relating to agricultura crops in Sumatra, prepared by W. F. van Hell. The damage caused in rubber plantations by mouldy rot (*Ceratostomella fimbriata*), *Fusarium*,

and stripe canker (*Phytophthora*) [*palmivora*: *R.A.M.*, xvi, p. 772] is stated to be largely controllable by the treatment of the tapping wounds with coal-tar oil (9 : 1) or resin-oil (60 : 40) mixtures, especially during the rainy season, the cost of the former being about 9 cents per kg. The clone Avros 52 suffered from a disorder of obscure origin characterized in the early stages by the development on the tapping surface of small, circular to oval, necrotic spots exuding latex, which subsequently accumulated between the wood and bark, causing the formation of lumps. Another disturbance of uncertain etiology affected the clone Avros 163, on which woody excrescences developed along the stem bark from the lowest branches downwards, causing a tendency to rupture.

No explanation is as yet forthcoming of a relatively innocuous oil-palm rot characterized by the presence in the centres of the stems of hollow, necrotic lesions. Some palms were also observed on one estate to be affected by a die-back of the tops, sometimes succeeded by the formation of a new growing point. *Fomes noxius* [ibid., xvi, p. 160, and below, p. 314] continues to be prevalent and little is done to combat it.

Botryodiplodia theobromae, *Ustulina maxima* [or *U. zonata*: ibid., iv, p. 69], and *F. lucidus* [*Ganoderma lucidum*] were found on *Albizzia falcata*. A dead tea bush bore the fructifications of *F. applanatus* var. *tornatus*, while *Rhizoctonia bataticola* [*Macrophomina phaseoli*] was present in the slender roots of the same host. A 'cobweb' fungus of the marasmioid type (without anker cells) was locally destructive to the green manures *Centrosema*, *Pueraria*, and *Vigna*.

Teak (*Tectona grandis*) was infected by slime disease (*Bacillus* [*Bacterium*] *solanacearum*) [ibid., xiv, p. 153].

Fiftieth Annual Report of the Colorado Agricultural Experiment Station, 1936–37.—62 pp., 8 figs., 1937.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xvi, p. 88]. The development by self-fertilization of homozygous strains of lucerne combining winter hardiness with resistance to bacterial wilt [*Aplanobacter insidiosum*: ibid., xvii, p. 252], leaf spot [*Pseudopeziza medicaginis*], and mildew [*Peronospora trifoliorum*: ibid., xii, p. 177; xvii, p. 44] is a problem requiring protracted experimentation. At present the wilt-resistant strains are susceptible to the two other diseases and vice versa.

A reduction in the incidence and arrest in the spread of peach mosaic have been effected by the joint efforts of the State Botany Section and the United States Bureau of Entomology and Pest Control, only 3,100 fresh cases being recorded up to 1st June, 1937, as compared with 9,835 and 30,467 in 1936 and 1935, respectively. All varieties cultivated in the Palisade district were found susceptible to mosaic [ibid., xvi, p. 820], which has been also transmitted to apricots, while Hungarian prunes grafted on infected peaches contracted the symptoms of the disease. There are indications that *M*[*yzus*] *persicae* is a vector of peach mosaic; *Lygus pratensis* and *A*[*phis*] *helichrysi* are also under suspicion in this connexion.

A species of *Phytophthora*, apparently identical with that responsible for pepper [*Capsicum annuum*] wilt [*P. capsici*: ibid., xvii, p. 157]

caused a soft, gelatinous rot of green and ripe cucumbers. The fungus was isolated from diseased material and its pathogenicity demonstrated.

A species of *Rhizoctonia* repeatedly isolated from beets [see below, p. 366] was shown by inoculation experiments to act as a weak vascular parasite.

Several strains of the causal organism of pink root of onions [*Phoma terrestris*: ibid., xvii, p. 7] appear to be present in the State, those isolated from certain soils being more than ordinarily virulent.

The Katahdin potato variety, which is undergoing extensive trials in all parts of the State, produces an exceptionally high percentage of No. 1 marketable tubers, gives yields comparable to those of the best local standard variety, and is resistant to mild mosaic, though susceptible to scab [*Actinomyces scabies*], haywire [ibid., xvi, p. 490], and spindle tuber. No significant reduction in the incidence of scab was obtained by soil treatments with calomel [mercurous chloride], yellow oxide of mercury, zinc amalgam, or copper amalgam, but the last named produced a substantial increase of yield.

VERONA (O.) & LUCHETTI (G.). **Note sull' azione di alcuni coloranti organici sullo sviluppo di tumori sperimentali da Bact. tumefaciens.** [Notes on the action of certain organic dyes on the development of experimental tumours caused by *Bacterium tumefaciens*.]—*Boll. Fac. Agraria, Pisa*, xiii, 15, pp. 193–195, 1 fig., 1937.

The results of experiments in which solutions of different concentrations of brilliant green and malachite green [*R.A.M.*, xv, p. 244] were introduced directly into tumours artificially induced on castor [*Ricinus communis*] seedlings by *Bacterium tumefaciens* are stated to have shown that at concentrations innocuous to the host these organic dyes had no effect on the tumours, while at higher concentrations they were lethal to the host plant.

GRIEVE (B. J.). **Studies in stimulation phenomena in plants due to Bacterium solanacearum.**—*Proc. roy. Soc.*, Ser. B, cxxix, 835, p. 42, 1937.

Further studies are stated to have shown that petiole-epinasty in tomato and other plants invaded by *Bacterium solanacearum* [*R.A.M.*, xv, p. 539; cf. also ibid., xvi, pp. 201, 285] is independent of gravity, and that heteroauxin is not produced in sufficient amount in the invaded vessels to bring about this growth reaction. The balance of evidence is taken to indicate that the proximate cause of petiole epinasty is some, as yet unidentified, by-product of bacterial metabolism, and a possible mechanism of the reaction is suggested.

ELLIOTT (CHARLOTTE). **The genus Phytomonas.**—*Phytopathology*, xxvii, 12, pp. 1181–1182, 1937.

The author cites data showing that the name *Phytomonas*, adopted by the Society of American Bacteriologists in Bergey's Manual, 1923, for plant-parasitic bacteria is inadmissible, since it was antedated by the flagellate genus *Phytomonas* 1909. The name *Erwinia* for plant-pathogenic rods with peritrichiate flagella will probably become more

widely used in place of *Bacillus*, which cannot now be applied to these species [*R.A.M.*, xvi, p. 482]. For other bacteria, two alternatives are open to plant pathologists, who may either follow Migula in the use of *Pseudomonas* for polar flagellate and *Bacterium* for non-motile rods, or adopt Smith's application of *Bacterium* to polar flagellate and *Aplanobacter* to non-motile plant-pathogenic bacteria.

OKABE (N.). **Studies on the variation of Bacterium solanacearum (preliminary report).**—*Ann. phytopath. Soc. Japan*, vii, 2, pp. 95–104, 1 pl., 1937. [Japanese, with English summary.]

Bacterium solanacearum, the agent of brown rot of Solanaceae and other plants, is well known to be very variable, not only in pathogenicity, but also in its morphological, physiological, and cultural characters. The organism was shown by the author's studies to consist of at least 16 types, of which four, viz. 'F', 'Op', 'C' [*R.A.M.*, xvii, p. 17], and 'SS' (forming circular, pale fluorite-green colonies with cream-coloured centres), were isolated from naturally infected tomatoes, tobacco, and eggplants in the field, while the remainder arose in subcultures from the four original isolates on various standard liquid media. Type 'F' is believed to represent the original form of *Bact. solanacearum*, while 'Op', 'C', and 'SS' are variants developing spontaneously in the tissues of diseased hosts which are found only in advanced stages of the rot or in old lesions. Ten of the 12 mutants are unstable in liquid media and readily change to other types. All the types of *Bact. solanacearum* under discussion are susceptible to the lytic action of the bacteriophage specific for the organism [loc. cit.].

ISAKOVA (Mme A. A.). **Effect of bacteriorhizal complexes on the development of the Sugar-Beet.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xvii, 3, pp. 150–152, 1937.

In the course of pot experiments with the Uladovka variety of sugar beet, the author treated the seeds of the plant with cultures of bacteriorrhiza [*R.A.M.*, xvi, p. 698] of the beet, pea, and lupin, as well as with *Azotobacter*, alone or combined with either of the three bacteriorrhiza, the treatment being sometimes repeated two or three times. The comparison of the treated plants with the controls showed that the maximum invigorating effect was obtained by the treatment with *Azotobacter* together with the bacteriorrhiza of the beet or pea, and that repeated treatment increased the effect.

From the similarity of the effect of *Azotobacter* to that of the bacteriorrhiza in nitrogen-rich soil, it is concluded that the effectiveness of the former cannot be due to its nitrogen-fixing ability, but is more probably to be explained by the accumulation of heteroauxin-like substances in the medium.

PETERSON (R. F.). **Problems in the development of rust resistant varieties of Wheat.**—*Rep. Canad. Seed Grs' Ass., 1936–37*, pp. 52–58, 1937.

This is a popular account of the problems involved in breeding superior stocks of wheat varieties resistant to stem and leaf rusts [*Puccinia graminis* and *P. triticina*]. It includes notes on desirable

characteristics, which determine the selection of parental material, and on the methods employed in breeding the hybrids. A detailed description is given of the tests for reaction to rust and other diseases, for agronomic characters, and for baking quality, which are applied before the final release of the new variety.

OLÁH (L. v.). **Über die Vererbung der Gelbrostresistenz bei verschiedenen Weizensorten.** [On the inheritance of yellow rust resistance in different Wheat varieties.]—*Z. Zücht.*, A, xxii, 1, pp. 45–74, 4 figs., 1 diag., 4 graphs, 1937.

The writer's studies on the mode of inheritance of yellow rust of wheat (*Puccinia glumarum*) [*R.A.M.*, xiv, p. 294], carried out at the Institute of Genetics and Plant Breeding, Friedrich Wilhelm University, Berlin, were directed primarily towards the solution of three problems, viz., (*a*) whether resistance is conditioned by multiple allelomorphs or evoked by other mutually independent genes; (*b*) how, if allelomorphs are not implicated, resistance is transmitted from one generation to another; and (*c*) whether protoplasm is involved in the inheritance of resistance.

The results [which are fully tabulated and discussed] of inoculation experiments with physiologic races 9 and 7 [ibid., xiii, p. 757] on the progeny of crosses between Carsten's Dickkopf, Michigan Amber, and Heine's Kolben showed segregation to be uniformly polymerous, thereby disposing of the theory of multiple allelomorphs. Transitional types of resistance may arise genotypically and not merely in response to modifying influences. It would seem that the relationships in yellow rust resistance are more complex than previous researches indicate [ibid., xvii, p. 231]. Some doubt is even cast on the existence of specific factors for inherent resistance, as opposed to the accidental escape from disease of plants maintained in a healthy condition by a coincidence of various nutritional and metabolic factors. Since almost all varieties differ in constitutional characters the highly divergent segregation relations obtaining in the various crosses are readily understandable. Although individuals resistant to both physiologic races of *P. glumarum* were found among the F_3 progeny in these experiments, they were all heterozygous. In reciprocal crosses no differences were detected that could be referred to protoplasmic influence.

SCHLEHUBER (A. M.). **Studies on the effect of bunt, Tilletia tritici and Tilletia levis, on Wheat.**—*Phytopath. Z.*, x, 6, pp. 614–631, 5 figs., 4 graphs, 1937.

Part I of these studies, concerned with winter hardiness in relation to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] infection of wheat, was carried out at the Halle (Germany) Agricultural and Plant Breeding Institute in 1936–7, while parts II and III, dealing, respectively, with the effect of the disease on growth rate and an abnormal type of smutting, were conducted at the State College of Washington.

Freezing injury was uniformly more severe in the Oro, Ridit, and Heil's Dickkopf varieties following inoculation with physiologic races A, E, and G (Halle district) of *T. caries* than in the non-infected con-

trols, though the differences were not always significant. The largest difference between the inoculated and control series occurred in Oro infected with races E and G (especially the former), which produce no smut balls in this variety. These observations denote the necessity of considering the special relationships existing between a particular host and a given pathogen [*R.A.M.*, xvii, p. 165] in plant-breeding problems.

The effect of bunt on wheat, whether stimulatory or depressing, depends on the variety, the physiologic race of the smut, and the stage of growth of the plants. In experiments with races Ft–4 [ibid., xv, p. 344] and Ridit *caries* of *T. caries*, and with a composite mixture of the two, on Turkey-Florence and White Odessa, the blend exerted a markedly lowering effect on both varieties at the end of the second leaf-growing period; taking the components of the mixture separately, Ridit *caries*, which produced 76 per cent. bunt on Turkey-Florence and 56 per cent. on White Odessa, stimulated both varieties, whereas Ft–4 retarded the growth of the former (resistant, only 0·85 per cent. infection) and accelerated that of the latter (highly susceptible, 94·9 per cent.). In Turkey-Florence the average dry weight per plant was highest (62 mg.) in the series inoculated with Ridit *caries*, causing the highest incidence of bunt, lowest with the virtually innocuous Ft–4 (54·6), and intermediate with the mixture (57·2). A parallel relationship exists in the case of White Odessa, the maximum weight (59·6) corresponding with virulent infection by Ft–4, the minimum (57·1) with the less severe Ridit *caries*, while the mixture is again intermediate (58).

An abnormal type of smut developing in Turkey-Florence plants inoculated with physiologic race Ft–4 of *T. caries* in 1933 consists in the formation of wholly, unilaterally, or partially sterile heads associated with a varying incidence of infection. In 1934 and 1935 F_3 and F_4 plants of White Odessa × Turkey-Florence were observed to be similarly affected. The condition is believed to be due to mycelial invasion, numerous smut balls, ranging in size from a pin's head to the normal dimensions, having been detected in the diseased spikelets.

Foster (W. R.) & Henry (A. W.). **Overwintering of certain cereal pathogens in Alberta.**—*Canad. J. Res.*, Sect. C., xv, 12, pp. 547–559, 8 figs., 1937.

After stating that the cereal foot rot fungi *Helminthosporium sativum*, *Fusarium culmorum*, *F. graminearum*, *Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, and *Wojnowicia graminis* have been shown to overwinter under natural conditions in Alberta, Canada, both in their mycelial and conidial stages, the authors give an account of experiments, the results of which demonstrated the high resistance of these organisms to cold. Thus, for instance, young germ-tubes of *H. sativum* resumed growth after being frozen solid overnight at 6° F., and agar cultures of *H. sativum* and *F. culmorum* remained viable after a 17-day exposure to temperatures ranging from about 0° to –50°. Mycelia of all the six species grown on sterilized barley grains survived in one case three months of continuous freezing, and in another case 40 alternate freezings and thawings over a period of two months. The

conidia of *H. sativum* proved less resistant to alternate freezing and thawing than to continuous freezing, but survived the treatment longer than the conidia of *F. culmorum* and *F. graminearum*. Viability was retained more readily by *H. sativum* on the soil surface than at depths of from 2 to 12 in., and soil aeration appeared to favour its survival, but this did not hold for *F. culmorum* and *F. graminearum*. Strains of *H. sativum* from northern latitudes did not prove to be more resistant to cold than strains from more southern latitudes.

The investigations showed further that both species of wheat bunt (*Tilletia caries* and *T. foetens*) may overwinter in Alberta as mycelium on winter wheats, but not as soil-borne spores; the latter may, however, be a factor in the renewal of bunt infection of winter wheats in western Canada. Powdery mildew (*Erysiphe graminis*) was shown to overwinter in the perithecial stage at Edmonton, Alberta, ascospores being formed in the spring, at the onset of favourable conditions and just before the first infections of winter wheat were observed.

HYNES (H. J.). **Some aspects of the root-rot problem in Wheat.**—*J. Aust. Inst. agric. Sci.*, iii, 4, pp. 212–218, 1 fig., 1937.

In this brief review of the more significant results of his investigations over a number of years [a full report of which is reserved for future publication] on the relationship between the development of foot and root rots of wheat in Australia [*R.A.M.*, xvii, p. 166] and rainfall during the whole vegetation period of the crop, the author states that controlled glasshouse experiments indicated clearly that the establishment of the parasites is favoured by low soil moisture content (30 per cent. saturation) during the early (pre-ear-peeping) growth stage, and that their stunting effect on the hosts was more pronounced in the series that was adjusted to a high moisture content (60 to 65 per cent.) in the late stages of growth than in that maintained at low moisture content throughout growth. In all cases diseased plants ripened earlier than healthy ones. The fact that the damage to the wheat plants was greatest in the pots that had been inoculated simultaneously with *Helminthosporium M.* (*Curvularia ramosa*), *H. sativum*, and *Fusarium culmorum*, the damage in the pots inoculated with one or two of the fungi being considerably less, is considered to support the author's contention that in Australia foot rot is not attributable to the action of *H. sativum* alone, but is in the majority of cases due to the activity of a complex of fungi, including possibly other species apart from the three named. The results of the controlled tests did not, however, agree fully with field observations concerning the effect of rainfall and its distribution during the growing period on foot rot development in the adult wheat plant, and additional surveys are needed to settle the question. Further tests to determine the effect of grazing by sheep in the spring and of the date of sowing on the development of foot rot, showed that cutting back wheat 12 in. tall to within 1·5 in. of soil-level resulted in appreciable stunting and noticeable reduction in yield of dry matter in practically every instance, and that root disease was most severe in adult plants which had been sown late in the season.

STRAIB (W.). **Über Resistenz bei Gerste gegenüber Zwergrost und Gelbrost.** [On resistance in Barley to dwarf rust and yellow rust.]—*Züchter*, ix, 12, pp. 304–311, 1937.

Several of the 508 barley varieties tested in the seedling stage in the greenhouse at the Gliesmarode (Brunswick) branch of the Biological Institute for their reaction to eight physiologic races of dwarf rust (*Puccinia simplex*) [*P. anomala*] and five of yellow rust (*P. glumarum*) including the two specific for this host, 23 and 24 [*R.A.M.*, xvii, p. 231], proved to be highly resistant to all forms, viz., Bolivia, Quinn, Palestine, and Spanish, while a further selection showed resistance to most races of both rusts except the French No. 13 of *P. anomala*, viz., *Hordeum tetrastichum pallidum* No. 2890, Australian 22, Biggo, Estanzuela 72d, Morocco, Nebraska, Schliephacke's, and Weider. Egyptian, Chilean D, Cruzat, Granat, Estanzuela, Peruvian, Ragusa, and Recka were resistant to all or most of the races of *P. anomala* and the three non-specific ones of *P. glumarum* but susceptible to 23 and 24. Gopal, Irisaka, Japan I, Nolc's Imperial, 3169, Bavaria, Heil's Franken, and Isaria were predominantly susceptible to all races of *P. anomala* but resistant to *P. glumarum* (the three last-named, however, being susceptible to race 24). The results of field tests from 1935 to 1937 indicated that a number of varieties contracting severe infection in the seedling stage under greenhouse conditions were adequately resistant to both rusts in the field. So far, however, no markedly resistant variety has been found among the winter barleys, and in general the outcome of the trial points to a heavy predominance of susceptibility to both rusts among the test material. The elimination from field crops of yellow rust indicators, i.e., varieties on which *P. glumarum* is capable of fructifying at relatively high temperatures, should be one of the foremost objects in the barley-breeding programme.

No correlation could be traced between resistance to the rusts and to mildew (*Erysiphe graminis hordei*) [ibid., xvi, p. 804].

BRIGGS (F. N.) & BARRY (G. L.). **Inheritance of resistance to mildew, Erysiphe graminis hordei, in a cross of Goldfoil and Atlas Barleys.**—*Z. Zücht.*, A, xxii, 1, pp. 75–80, 1937.

The results of a study at the California College of Agriculture on the inheritance of resistance to barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, xv, p. 9; xvi, p. 376] in Goldfoil (resistant) and Atlas (susceptible) hybrids indicated that the former variety differs from the latter in one major factor for resistance to the disease, and that resistance is incompletely dominant. Susceptible plants segregated from the cross between Goldfoil and the resistant Hanna, showing that different factors are responsible for resistance in these two varieties. In future the factor for resistance to mildew in Goldfoil will be designated GG and that in Hanna HH. No linkage could be traced between mildew reaction and one factor pair each belonging to linkage groups 1 (non-six-rowed versus six-rowed spikes) and 2 (long- versus short-haired rachilla).

TAPKE (V. F.). **Physiologic races of Ustilago hordei.**—*J. agric. Res.*, lv, 9, pp. 683–692, 1937.

A tabulated account is given of the author's studies from 1934 to 1936, inclusive, at Ithaca, New York, the results of which showed the presence in 200 collections of *Ustilago hordei* [*R.A.M.*, xvi, p. 737] from 26 of the United States of eight physiologic races, differing from one another in their reaction on five named varieties of spring barley. Of these physiologic races No. 6 was the most widely distributed, as it was found to occur in 21 of the 26 States, and was isolated from 114 of the 200 smut collections. In California and Washington, however, another race (5) was conspicuously prevalent, occurring 51 times in 60 collections from these two States; a possible explanation of this prevalence in California may be the still existing popularity of Coast barley which was introduced as early as 1770 by the Spanish missionaries. Under the conditions of a one-year (1935–6) test with 28 winter varieties or selections of barley, little clear-cut differential host response to the eight races was obtained, possibly because of marked differences in varietal response to winter injury.

The investigations also showed that Pannier (C.I. 1330) barley was highly resistant to, or immune from, seven of the eight races of *U. hordei*, and only moderately susceptible to one. *Hordeum deficiens* (C.I. 668–1) and *H. intermedium* (C.I. 4377), used only in the 1934 test, were highly resistant to, or immune from, the six races occurring in the collections of that year. These three barleys are also highly resistant to *U. nigra* [ibid., xvi, p. 375].

LEVINE (M. N.) & SMITH (D. C.). **Comparative reaction of Oat varieties in the seedling and maturing stages to physiologic races of Puccinia graminis avenae, and the distribution of these races in the United States.**—*J. agric. Res.*, lv, 10, pp. 713–729, 8 pl., 1937.

In the course of greenhouse experiments carried out at the Minnesota Agricultural Experiment Station, inoculations with the ten known physiologic races of oat stem rust, *Puccinia graminis avenae* [*R.A.M.*, xvi, p. 446], were made on 27 varieties and strains of oats in the seedling stage and on seven of these varieties in the adult stage; six other varieties, also in the adult stage, were inoculated with race 6 only.

The results of these experiments showed that the reactions of seedling and maturing plants of every one of the varieties tested to all the parasitic races were in close agreement. It would seem, therefore, in the absence of important exceptions not falling within the limits of these experiments, that seedling reaction can be considered a reliable index of the reaction of adult oat plants to specific physiologic races of *P. graminis avenae*.

Of five physiologic races (1, 2, 5, 7, and 10) of *P. graminis avenae*, isolated during the 15-year period 1921–35 from rusted oat material collected in various parts of the United States, only races 2 and 5 have played a significant part in the stem rust epidemics of this period; race 1 was of some consequence on certain occasions but on the whole of small importance, and races 7 and 10 of none whatever, as far as the United States are concerned.

The restricted physiologic specialization of the oat stem rust fungus in the United States is favourable to the breeding of rust-resistant varieties. The varieties Hajira, Hawkeye, Iogold, Iowa D 67, Rainbow, and Richland are adequately resistant to races 1, 2, and 5 and highly resistant to race 7; the varieties Anthony, Green Mountain, Minnesota 742, Minrus, and White Tartar are at least moderately resistant to races 1, 2, 5, 7, and 10.

KITUNEN (E.). **Untersuchungen über die Lebensweise des Haferbrandes Ustilago avenae (Persoon) Jensen.** [Studies on the life-history of the Oat smut *Ustilago avenae* (Persoon) Jensen.]—*Suom. Maataloust. Seur. Julk.*, xxxv, 2, pp. 89–144, 8 figs., 1937. [English summary.]

The author tabulates and fully discusses the results of his studies on loose smut of oats, which is stated to be caused almost exclusively by *Ustilago avenae* in Finland. Samples of diseased material from the 1933–6 harvests were submitted for examination from various parts of the country, as well as from Sweden, Denmark, and Holland, and spore counts were made by washing or centrifuging. In nearly all the samples there were two to four times as many spores on the outer as on the inner sides of the glumes, but in a few instances the position was reversed, showing that either region may provide the inoculum for an attack of loose smut. Most of the spores both on the inside and the outside of the glumes were found to preserve their germinative capacity during the resting period of the seed-grain. In inoculation experiments in the field on oat flowers protected by parchment cones a maximum of one-third of the spores of *U. avenae* germinated during the first 24 hours after inoculation, mostly on the stigmas, little activity being observed among those that had fallen deeper into the flower, though they were experimentally shown to be capable of germination. During the next 24 hours renewed germination took place. Fusion seldom occurred between the sporidia ultimately developing from the spores and no resting stage was detected. Most of the mycelium found in profusion in all the samples at an advanced stage of infection appeared to belong to such common moulds as *Cladosporium* and *Heterosporium*, and in no case was a vegetative phase of *U. avenae* observed. Moderately infected samples of seed-grain may be practically freed from smut by cleansing the glumes and caryopses, thereby affording additional confirmation of the absence of overwintering mycelium within the tissues and showing that the spores, which alone are of any practical importance in the invasion of the seedling, adhere so loosely to the seed as to be readily detachable. The sporidia cannot survive drying, and can therefore play no part in the overwintering of the fungus.

MCNEW (G. L.). **Isolation of variants from cultures of Phytomonas stewarti.**—*Phytopathology*, xxvii, 12, pp. 1161–1170, 1 fig., 1 graph, 1937.

From dilution plates of virulent cultures of *Phytomonas* [*Aplanobacter*] *stewarti* [*R.A.M.*, xvii, p. 238] on nutrient broth agar plus 0·5 per cent. dextrose (P_H 6·8 to 7) the writer isolated 25 variants classified, according to their capacity for producing necrotic lesions and wilting

in ten-day-old Golden Bantam maize seedlings, as slightly virulent (infection index under 0·20), weakly virulent (0·20 to 0·55), virulent (including the parent class and 16 derivatives, causing large necrotic lesions and intense chlorotic streaks), and highly virulent (over 0·90, comprising five strains producing all the symptoms of the virulent category and further causing severe wilting). Only one of the variants belonged to the slightly virulent class and two to the weakly virulent. Two white, semi-rough variants, producing a firm, white, filiform streak on transference to agar slants, developed during a seven-hour incubation of one subculture. These strains, though almost as virulent as the parent culture, only survived for seven weeks at room temperature instead of three months, the period of viability of most of the yellow colonies. Variants were isolated from cultures from infected maize plants in New Jersey, New York, and Iowa after passage through five serial dilutions.

Annual Report of the Veterinary and Agricultural Department, British Somaliland, for 1937.—27 pp. [? 1938. Mimeographed.]

During 1937 sorghum common smut [*Sphacelotheca sorghi*: *R.A.M.*, xvi, p. 666] was less prevalent everywhere in Somaliland than formerly; seed dusting with sulphur at the rate of 8 oz. per 160 lb. of seed appeared to give good results [ibid., xvii, p. 15]. Bulrush millet [*Pennisetum typhoides*] was affected by 'blindness' attributed to drying winds. A variety of maize from Kenya was badly infected by *Diplodia* [*zeae*].

Bates (G. R.). **Report of the Plant Pathologist for the year ending December 31st, 1936.**—*Rep. Brit. S. Afr. Co., Mazoe Citrus exp. Sta., 1936*, pp. 157–167, 1937.

During 1936, most of the decay found in oranges in the packing-house at the Mazoe Citrus Experimental Station, Southern Rhodesia [cf. *R.A.M.*, xvi, p. 528], was due to *Penicillium digitatum* [ibid., xvi, p. 601; xvii, pp. 106, 171]; *P. italicum* was less common than previously, but *Oospora citri-aurantii* [loc. cit.], *Diplodia natalensis*, and *Alternaria citri* were very prevalent. Excessive wastage was favoured by late rains and high temperatures.

Brown rot (*Phytophthora citrophthora*) was recorded on Valencia Late oranges for the first time.

Further experiments on the artificial infection of sound oranges with *P. digitatum* confirmed the results previously obtained [ibid., xvi, p. 528]. All the methods used in rind inoculations gave similar results, but the rate of decay was much accelerated when the original inoculum penetrated to the pulp. Evidences of tree-to-tree and seasonal variation in the rate of decay were found, which are certainly related to the intensity of wastage in the packing-house and during transit.

In investigations of dormant infections in the rind of sound, unblemished oranges no latent infections were observed on very young fruits of about 1·5 gm. weight. Oranges weighing about 20 gm. occasionally showed latent infection by *A. citri* in the rind tissues immediately below the calyx, latent infections being detected in 40 per cent. of the buttons from these fruits. Six weeks later, when the average

weight of the oranges was 49·1 gm., some 90 per cent. of several hundred pieces of rind tissue cultured contained latent infections of *Colletotrichum gloeosporioides*, while about 9 per cent. had latent infections of *A. citri*, and a similar percentage showed *Glomerella cingulata*.

Studies of cold storage injury in Jaffa oranges in relation to fertilizer treatment in the orchard showed that most damage occurred in fruit from trees given liberal dressings of phosphate, heavy potash dressings coming next, closely followed by reduced quantities of complete fertilizer, and manure only; the least injury was found in fruits from trees given a complete fertilizer mixture. Pitting was observed after one week's storage at 40° F. and reached a maximum at the end of two weeks. Scald appeared in only two samples after two weeks, but was commonly present in all samples after three weeks. It appeared to be closely correlated with transpiration; samples showing the most loss of weight during storage also developed most scald. Pitting was confined to lightly coloured fruits after one week's storage, and was found especially in oranges with pre-picking blemishes, the original scars forming foci for the development of cold injury. A new type of blemish found in cold storage consisted of irregular, depressed lesions, mostly at the stem-end and involving both flavedo and oil vesicles. It would appear to be associated with gradual desiccation, possibly accentuated by mechanical injury or excessive pressure during early handling.

Some delayed wastage due to *P. digitatum* occurred among Jaffa oranges in cold storage. In one test with commercially treated Valencia Late oranges *P. italicum* and *P. digitatum* caused a small proportion of the stem-end rot that developed after prolonged storage. *C. gloeosporioides* and *A. citri* were mainly responsible for the stem-end, lateral, and centre rots occurring in storage. *D. natalensis* accounted for about 30 per cent. of the stem-end rot in Valencia Late and Jaffa oranges. *Phomopsis* [*Diaporthe*] *citri* was occasionally found. A *Septoria* spot, attributed provisionally to *S. citri* [ibid., xv, p. 774], attacked Jaffa and Valencia Late oranges after about six weeks in cold storage. *Haplosporella* (*Sphaeropsis*) *hesperedica* [cf. ibid., xi, p. 697] was isolated from Valencia Late oranges showing firm, pale brown blemishes.

Among Valencia Late oranges from different fertilizer groves the greatest amount of *A.* [*citri*] wastage occurred on fruits from trees given heavy dressings of nitrogen.

Heavily oiled and moisture-proof cellophane wrappers were conducive to increased wastage. There was, however, no significant difference as regards wastage between ordinary, untreated sulphite paper and paper containing 3½ per cent. of mineral oil. Oranges in standard cellophane rapidly became shrivelled, while moisture-proof cellophane gave considerable control of low-temperature blemishes and loss of weight. The smallest loss in weight was shown by fruits in 15 per cent. oil-treated wrappers. Among unpacked oranges there was little difference in percentage loss of weight at 40° but at 68° all the oil-treated wrappers, especially the 15 per cent. type, checked loss of weight to some extent. Standard cellophane increased loss of weight, while moisture-proof cellophane strikingly reduced it at both temperatures. Unwrapped fruit showed a lower percentage loss in weight at both temperatures than fruit in sulphite wrappers.

Bates (G. R.). **Diseases of Citrus fruits in Southern Rhodesia.**—*Rep. Brit. S. Afr. Co., Mazoe Citrus exp. Sta., 1936*, pp. 173–208, 5 pl., 2 graphs, 1937.

In this paper the author gives a comprehensive, semi-popular account, based on several years' investigations at the British South African Company's estates, of the different rots and blemishes affecting Southern Rhodesian citrus fruits intended for the English market, special prominence being given to troubles developing in the packing-house [see preceding abstract].

Stahl (A. L.) & Cain (J. C.). **Cold storage studies of Florida Citrus fruits. III. The relation of storage atmosphere to the keeping quality of Citrus fruits in cold storage.**—*Bull. Fla agric. Exp. Sta.* 316, pp. 3–41, 7 figs., 4 graphs, 1937.

In further studies carried out in Florida on the behaviour of citrus fruits in cold storage under different gaseous and atmospheric conditions [*R.A.M.*, xvi, p. 742] pitting in Silver Cluster grapefruits was increased by storage in oxygen, and slightly decreased by storage in nitrogen, as compared with storage in ordinary air, while small quantities of carbon dioxide appeared to reduce this tendency. Sogginess, or physiological breakdown, developed abundantly in an atmosphere of carbon dioxide, and the affected fruit did not revive after treatment with oxygen. Pineapple oranges and McCarty grapefruits stored in nitrogen retained their firmness and bright colour, but developed a musty taste.

Reiniger (C. H.). **Observações sobre o emprego do metaborato de sodio no controle da podridão peduncular da Laranja.** [Observations on the use of sodium metaborate in the control of stem-end rot of Orange.]—ex *Campo, Rio de J.*, pp. 45–48, 10 figs., 1 graph, 1937. [English summary. Mimeographed.]

Immersion of oranges from a 20-year-old grove badly infected with melanose [*Diaporthe citri*] in a 6 per cent. solution of sodium metaborate gave effective control of stem-end rot (*Phomopsis* [*D.*] *citri* and *Diplodia natalensis*) [*R.A.M.*, xvii, pp. 27, 106], which in the untreated controls caused serious decay. Sodium metaborate possesses the advantage over borax of being perfectly soluble in cold water up to 6 per cent. concentration.

Parham (B. E. V.). **Citrus diseases in Fiji.**—*Agric. J. Fiji*, viii, 4, pp. 22–24, 1937.

Brief notes are given on the symptoms and control of the following diseases of citrus in Fiji, viz., mottle leaf [*R.A.M.*, xvii, p. 170], which, locally, mainly affects grapefruit, collar rot or gummosis, usually occurring on sweet orange stock budded low, but the cause of which in Fiji has not yet been ascertained, bark crack, mostly found on grapefruit, sooty mould (*Capnodium citricolum*) [ibid., xiv, p. 60], and scab (*Sporotrichum citri*) [*Elsinoe fawcetti* [ibid., xvi, pp. 655, 729].

Brown rot control.—*Calif. Citrogr.*, xxiii, 1, p. 46, 1937.

As severe damage sometimes results when citrus trees sprayed with

ordinary Bordeaux mixture against brown rot in California [*Phytophthora citrophthora, P. parasitica, P. hibernalis*, and *P. syringae*: *R.A.M.*, xvi, p. 312] are fumigated against insect infestation a few months later, and as repeated applications of Bordeaux mixture render the trees susceptible to such damage for some years after the spray applications have ceased, it is recommended that a spray composed of 12 lb. zinc sulphate, 1 lb. copper sulphate, and 6 lb. hydrated lime, with or without a spreader, should be substituted. This mixture in three years' extensive field trials has proved as effective against brown rot as Bordeaux mixture 3–3–50, and no damage has resulted from heavy applications of it made up to within a few days of fumigation. To avoid injury from drifting gas 48 hours should elapse before fumigating an orchard adjacent to one sprayed with Bordeaux mixture.

Rhoads (A. S.). **Observations on psorosis of Citrus trees in Florida.**—*Citrus Ind.*, xviii, 5, pp. 8–9, 16–17, 1937. [Abs. in *Exp. Sta. Rec.*, lxxviii, 1, p. 69, 1938.]

A survey made in 1936 of a block of 306 orange trees in Florida indicated that psorosis [*R.A.M.*, viii, p. 158; xvii, p. 106] had, since the previous survey in 1927, disappeared from 9 and appeared on 14 additional trees. In a row of grapefruit the rate of progress was comparable. New cases developed sporadically, and there was no evidence of the disease on trees replacing those removed because of the condition. Scraping the bark gave effective control except on trees in which the disease appeared to have become systemic.

Cooke (F. C.). **The practical aspects of copra deterioration.**—*Gen. Ser. Dep. Agric. S.S. & F.M.S.* 28, 49 pp., 3 pl. (1 col.), 1 fig., 1937.

In this study of the practical aspects of copra deterioration, the mycological aspects of which have been dealt with in a previous bulletin [*R.A.M.*, xvii, p. 28], and its prevention, the author, after briefly reviewing the literature of the subject, states that in Malaya attack by any of the organisms concerned requires the presence of moisture, and is most severe on the wettest pieces of copra, on copra on which moisture has condensed, and on copra stored in a stagnant, moisture-saturated atmosphere. As soon as the nut is split open the inner surface of the meat provides an ideal medium for mould and bacterial development, but there is little danger of infection when the moisture content is reduced promptly during drying to 8 and, if possible, 6 per cent. If the drying process is unsatisfactory, discontinuous, or incomplete the material softens and rots, after which a succession of moulds may develop.

In a section dealing with the prevention of deterioration the author recommends sun-drying for five hours before kiln-drying; or cracking the nuts (without splitting) and allowing the milk to drain away before placing them on the kiln. By these methods bacterial contamination can be avoided.

Thompson (A.). **Observations on stem-rot of the Oil Palm.**—*Sci. Ser. Dep. Agric. S.S. & F.M.S.* 21, 28 pp., 14 pl., 1937.

Observations made on a block of 720 oil palms planted on quartzite

soil with a sand-pan situated at varying depths below the surface showed that *Fomes noxius* [*R.A.M.*, xvi, p. 656] is mainly responsible for stem rot. Infection occurs by means of spores germinating on the cut surface of the leaf bases or in wounds nearer the stem, extends laterally round the stem in the outer tissue, penetrates the inner tissues, and finally causes the death of the palm after two or three years. Progress of the disease is more rapid when infection occurs near ground-level. The decayed tissue in the diseased stem is sometimes zonate, with alternating bands of dark and light brown. The cells of the darker tissue contain curled masses of dark brown, spiny, septate hyphae; the hyphae in the lighter tissue are more hyaline with fewer septa and are arranged roughly in parallel lines extending from cell to cell. The rot spreads slightly more rapidly in backward palms and abnormally quickly in palms killed by lightning. It is intensified by moist conditions and occurs mostly in areas of deep peat or on quartzite soils with a pan of sandy subsoil. *F. noxius* does not attack the roots and therefore there is little danger in burying the palms killed by it. Treatment by excision of decayed tissue is advocated only for areas, particularly of deep peat, where economic yields are still obtainable, and where supplies are likely to be less vigorous than the palms they replace. 'Hat-peg' pruning, which reduces wounding, is recommended as a preventive measure.

Other fungi found on the oil palm are relatively harmless. *Ganoderma lucidum* is responsible for a rarer form of stem rot and is apt to attack the roots, which is also true of *Ustulina zonata*, responsible for 'charcoal-base rot'. There is, therefore, a risk of root infection from buried palms killed by these fungi and burning is recommended. *G. lucidum* is regarded as a facultative parasite, but *F. lignosus* seems to be only saprophytic on oil palms.

GOIDÀNICH (G.). **Il marciume dell'inflorenza della Palma da Dattero causato da Mauginiella scaettae Cav.** [The Date Palm inflorescence rot caused by *Mauginiella scaettae* Cav.]—Reprinted from *Agricoltura colon.*, xxxi, 10, 9 pp., 5 figs., 1937.

A brief, semi-popular account, based chiefly on Chabrolin's study of the disease, is given of the symptoms, causal organism, and control of the rot of date palm inflorescences caused by *Mauginiella scaettae* [*R.A.M.*, ix, p. 239; xii, p. 303]. Practically all the information given has already been noticed in this *Review*.

CARDONA (A. N.). **Las enfermedades fungosas del Cafeto.** [The fungous diseases of Coffee.]—*Agricultura, Mexico*, i, 2, pp. 37–39, 1937.

Popular notes are given on the occurrence and control of the three most prevalent diseases of coffee in Mexico, viz., leaf spot (*Stilbella* [*Omphalia*] *flavida*) [*R.A.M.*, xvi, p. 378], thread blight (*Corticium koleroga*) [ibid., xvi, p. 657 and above, p. 298], and sooty mould (*Capnodium coffeae*) [cf. ibid., vi, p. 352; vii, p. 630].

WALLACE (G. B.). **Report on Plant Pathology.**—*Rep. Coffee Res. & Exp. Sta., Lyamungu, Moshi, 1936* (*Pamph. Dep. Agric. Tanganyika* 19), pp. 82–85, 1937.

In a comparative spraying and dusting experiment against coffee leaf disease (*Hemileia vastatrix*) [*R.A.M.*, xvi, p. 796] in Tanganyika in 1936 the best result out of 13 different treatments was given by 1 per cent. Bordeaux mixture plus linseed oil; linseed oil alone had only a negligible effect, as had groundnut oil alone or plus agral I; very little, if any, control followed two applications of each of four proprietary dusts; and the four proprietary wet sprays tested were less effective than Bordeaux mixture. In a second similar experiment, 1 per cent. Bordeaux mixture applied alone was quite effective, the following stickers and spreaders giving no advantage as regards increased retention of spray deposit: linseed oil, groundnut oil, fish oil soap, a proprietary spreader, sulphite lye, a proprietary wetting compound, alum, and resin soda.

Improved cultural practices gave 95 per cent. control of the coffee disease recently reported, and attributed to a species of (?) *Stilbum* [ibid., xiv, p. 13]. In the treated plantation about 1 to 5 per cent. of the leaves were spotted, the affected leaves showing from one to about five spots each, whereas in a neighbouring plantation abandoned two years previously about 80 per cent. of the leaves each showed 1 to 50 spots. No sclerotia or fruiting bodies were observed, and the gemmae characteristically present in nature did not develop in culture. No stage of the fungus was found by which its systematic position could be determined, and it is not at present possible to identify it.

Dry collar rot of *Coffea arabica* in the seedling stage [ibid., xv, p. 704] takes the form of callused, canker-like swellings at the collar, occasionally with marked constriction below. The epidermis covering the swellings is loose and flaky. Both the external and internal symptoms are similar to those found in older plants, and it is expected that both diseases will be found to have the same origin.

Coffee stems showed an unusual condition resembling gnarled stem canker of tea [ibid., xiii, p. 327], the main stem at the base of each branch having a cankered appearance; the bark was loose and peeling, and sometimes the affected part was flat or sunken.

Coffee cuttings in frames affected by damping-off in many cases showed the presence of a species of *Rhizoctonia* which is one of the fungi causing the disease under cultural conditions more or less essential to the propagation of cuttings.

Hosking (H. R.) & Jameson (J. D.). **Botanical work, Serere.**—*Rep. Dep. Agric. Uganda, 1936–37* (Part II), pp. 84–103, 1938.

In further cotton-breeding trials in Uganda in 1936–7, the variety N. 17 was extraordinarily successful, its performance being unquestionably superior to that of S.G. 29, in spite of the low incidence of blackarm (*Bacterium malvacearum*) [*R.A.M.*, xvi, p. 235]. The high yield of S.P. 20 was maintained. S.P. 87 failed owing to late maturity, relapse from high blackarm resistance in the U. 4 trials, and unfavourable spinners' and brokers' reports. S.P. 84 did not give such a high yield as S.P. 20 but was better than S.P. 87 on all counts, obtaining consistently favourable spinners' and brokers' reports in a manner that has no parallel among U. 4 derivatives at Serere.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Relation of soil acidity to Cotton root rot.**—*Bull. Tex. agric. Exp. Sta.* 545, 39 pp., 1 fig., 1937. [Abs. in *Exp. Sta. Rec.*, lxxviii, 1, pp. 61–62, 1938.]

When *Phymatotrichum omnivorum* [*R.A.M.*, xvii, p. 172] was inoculated into cotton plants in adjacent containers filled with soils varying naturally in P_H value, the original incidence of root rot, its rate of spread, and its ability to overwinter were greater in the alkaline than in the acid soils. Further experiments indicated that only low percentages of infection or of overwintering occurred in soils more acid than P_H 5, whereas at P_H 8 to 8·5 high degrees of infection occurred and the disease killed many plants for years afterwards. Overwintering was not reduced by additions of manures, fertilizers, or trace elements. Cotton plants were more tolerant than was the fungus of soil alkalinity produced by additions of sodium carbonate. Relatively large amounts of sulphur when added to the less calcareous soils produced acidification, but also injured the roots, while lighter dressings were non-injurious and in some cases temporarily beneficial. The results obtained indicate, on the whole, that acid soils and those made acid chemically are less favourable to infection by *P. omnivorum* or to the continued survival of the fungus than alkaline soils or soils made alkaline.

STREETS (R. B.). **Phymatotrichum (Cotton or Texas) root rot in Arizona.**—*Tech. Bull. Ariz. agric. Exp. Sta.* 71, pp. 299–410, 36 figs., ? graphs, 2 maps, 1937.

In this paper the author gives an account of root rot caused by *Phymatotrichum omnivorum* [*R.A.M.*, xvi, p. 672 and preceding abstract] on cotton and numerous other hosts. He states that the fungus has a host range of over 1,700 species of plants. The total annual losses in Arizona from root rots caused by this fungus are estimated at $500,000 as compared with $100,000,000 in Texas and $50,000,000 in six other affected States combined. The symptoms and the characteristics of the fungus are described. The most effective control measures are stated to be long-term rotations with non-susceptible crops (at least 3 years), clean cultivation, heavy applications of organic manure, a dressing of 4,350 lb. ammonium sulphate per acre followed by irrigation, soil disinfectants, barriers in the form of rows of non-susceptible crops or trenches filled with a mixture of soil and sulphur (2 to 4 per cent), waste oil, or crude carbolic acid, and surface applications of sulphur, on which experimental work is in progress. A bibliography of 157 titles is appended.

FAHMY (T.). **Giza 27, a wilt immune strain of long staple Cotton.**—*Bull. Minist. Agric. Egypt* 176, 13 pp., 12 diags., 1 chart, 1937.

A fully tabulated account is given of work carried out at Giza between 1928 and 1935 on the selection of a new strain of long staple cotton, Giza 27, immune from wilt [*Fusarium vasinfectum* var. *aegyptiacum*: *R.A.M.*, xv, p. 648]. The parents are Giza 7, a totally immune strain of good yield, high ginning yield and medium staple, and Sakla 3, a highly susceptible Sakel selection; both are of Egyptian origin. Full details are given of the method of selection, first for immunity [ibid., xiii, p. 632], and then for quality, up to the F_8 generation,

with the results of spinning and chequer trials. The strain was found to have a better lint quality but a lower yield than Giza 7, with a heavier yield than Sakla 3.

While it is not yet possible to say whether Giza 27 will be introduced to the market or not, the story of its production is considered to warrant publication at this stage, when the scientific part of the work is complete.

NEAL (D. C.). **Crinkle leaf, a new disease of Cotton in Louisiana.**—*Phytopathology*, xxvii, 12, pp. 1171–1175, 2 figs., 1937.

A new cotton disease, described as 'crinkle leaf', is prevalent in certain localized areas on Lintonia and Olivier silt loam ('bench' or 'bluff') soils in Louisiana, where it was first observed in 1934 by H. B. Brown, of the Agricultural Experiment Station. Several upland varieties are affected, including Half and Half, Clevewilt, Express, Dixie-Triumph, Deltapine, and a Sea Island × Upland hybrid. The leaves are puckered, mottled, semi-chlorotic, and distorted in the early stages; subsequently necrotic lesions develop along and between the veins, and approaching maturity is accompanied by thickening, brittleness, and marginal raggedness. The branches are usually fasciated, though apparently normal ones sometimes arise from the basal nodes of the diseased main stem. The involucral bracts, floral buds, flowers, and bolls are abnormally small and often markedly asymmetric, the bracts and bolls also being deficient in chlorophyll. Distorted bolls mature very irregularly, producing weak fibre and almost worthless lint. The cortical, pith, and vascular tissues of the terminal branches are imperfectly developed and the normal metabolism of the plant thereby greatly impeded. 'Crinkle leaf' presents certain analogies with previously reported abnormalities, including crazy top [*R.A.M.*, xiv, p. 629] and inherited 'round' or 'crinkly' leaf, from which it differs, however, in various distinctive features and in the manifest absence of any hereditary tendency. Inoculation experiments and attempts to transmit the disorder by grafting gave negative results, but symptoms similar to those described above have been observed on greenhouse cotton plants grown in steam sterilized Lintonia silt loam soil.

CHAROBIM (W. M.). **Moisissure noire des cocons Aspergillus phoenicis (Corda).** [Black mould of cocoons, *Aspergillus phoenicis* (Corda).]—*Bull. Minist. Agric. Egypt* 185, 5 pp., 5 pl., 1937.

Details are given of the writer's experiments showing that the black mould of silkworm cocoons, due to *Aspergillus phoenicis* [*R.A.M.*, x, p. 184], can only infect the dead chrysalids (killed either by five hours' exposure to sunshine or 15 minutes' at a temperature of 80° C., which is not sufficient to kill the spores) in the presence of sufficient humidity to permit of spore development. Complete desiccation of the cocoons was obtained by exposure to sunshine for six hours a day during a period of eight days, and no trace of infection was found in the group thus treated.

PETCH (T.). **Isaria exoleta Fr.**—*Naturalist, Lond.*, pp. 250–251, 1936. [Received December, 1937.]

In July, 1936, the author received from Tadcaster, on a Lepidopterous pupa, a *Hirsutella* with phialides 20 to 40 μ high with an inflated, usually flask-shaped, but often irregular base measuring 12 to 18 by 5 μ and attenuated above into a stout sterigma up to 20 μ long. These organs were arranged singly or in clusters at the apices of short hyphae 4 μ in diameter, giving the clava a granular appearance under a low magnification. The oval or lemon-shaped spore cluster measured 10 by 7 μ, and the individual, hyaline, cymbiform conidia had rounded ends and measured 9 by 2·5 μ. Seen by transmitted light, the exterior layer of the solid core of the clava was fuliginous. Two further specimens were found at Hubberholme in September, 1936, under moss on rocks. The fungus was found to be identical with *Isaria exoleta* Fr. and *Cordyceps fuliginosa* Ces., which was a conidial form, not a *Cordyceps*. It is renamed *H. exoleta* comb. nov.

COUCH (J. N.). **The formation and operation of the traps in the nematode-catching fungus, Dactylella bembicodes Drechsler.**—*J. Elisha Mitchell sci. Soc.*, liii, 2, pp. 301–309, 1 pl., 1937.

An account is given of the author's studies on *Dactylella bembicodes* [*R.A.M.*, xvii, p. 36] in pure culture on a variety of media. On moist wood or in aqueous solutions containing nematodes, the fungus forms, on short 2-celled stalks, numerous small rings or loops, each consisting of three cells, the apical one of which anastomoses with the basal cell and with the top cell of the stalk. The loops measure 24 to 31 μ in outside and 16 to 21 μ in inside diameter. Such rings are also produced on certain nutrient agars and when the food material is reduced. On media on which no rings were formed, e.g., maltose peptone agar, their formation was induced by acidifying the substratum to a certain degree or by adding to it a drop of the brownish water from the original dish containing the fungus and nematodes. Direct observations under the microscope showed that when a nematode thrusts its head or tail into one of the rings, the latter closes practically instantaneously by the simultaneous swelling of the three cells of the loop. Partial closure of the rings was induced by inserting a fine glass rod and moving it back and forward in the loop, and a slight swelling of the cells in a few rings was stimulated by a 1 per cent. lactic acid solution. Complete and instantaneous closure was obtained by the application of dry heat to the surface of the culture or by the addition of a drop or two of water at a temperature between 33° and 75° C.; water above 80° failed to induce closing of the loops, the cells being killed. While there is no apparent relation between the results of these experiments and the closure induced by the 'cold-blooded' nematodes, it is assumed that a chemical substance is given off by the latter, which causes the colloids inside the loop cells to swell. After capture the nematode is rapidly destroyed by the fungus, and the possibility is suggested of using the organism for the biological control of soil-inhabiting nematodes.

TIFFNEY (W. N.) & WOLF (F. T.). **Achlya flagellata as a fish parasite.**—*J. Elisha Mitchell sci. Soc.*, liii, 2, pp. 298–300, 1937.

The authors state that *Achlya flagellata* [*R.A.M.*, xi, p. 397] was found in 1935 attacking a newt (*Triturus viridescens*), in association with *Saprolegnia parasitica* [ibid., xvi, p. 745] in a small pond near Lexington, Massachusetts, and was further isolated alone from 12 out of 70 fish (*Lebistes reticulatus*) which were kept for experimental purposes in an aquarium tank at Cambridge, Massachusetts; all the infected fish died eventually. The organism isolated from the latter was then shown experimentally to be pathogenic to other fish (*Fundulus heteroclitus*), slightly injured by the removal of a few scales, 9 out of 25 individuals in the infected tank dying. During the early summer of 1936 *A. flagellata* was responsible for the death of about 50 per cent. of fingerlings of the brook trout (*Salvelinus fontinalis*) in Bayfield Hatchery, Wisconsin, but fingerlings of the brown trout (*Salmo fario*) and rainbow trout (*S. irideus*) in the same hatchery appeared to be almost immune from it. It appears, therefore, that under Wisconsin conditions *A. flagellata* may at times become a destructive parasite of fish.

CASTELLANI (A.). **A preliminary report on two pathogenic fungi: Trichophyton dankaliense n.sp., and Sporotrichum anglicum n.sp.**—*J. trop. Med.* (*Hyg.*), xl, 24, pp. 313–318, 3 pl. (1 col.), 11 figs., 1937.

From a piece of camel skin submitted for examination by the Plant and Animal Products Department of the Imperial Institute the author isolated a species of *Trichophyton* forming rust- to orange-red cultures on glucose agar, peptonizing milk, liquefying gelatine, and serum, but elaborating neither acid nor gas from the various sugars and carbohydrates tested, with the possible exception of arbutin. The fungus was grown on a number of other standard media, of which potato agar and carrot slants induced the most characteristic mode of development. Hanging-drop cultures on peptone water and physiological saline solution showed the presence of hyphae ranging from 2 to 4·5 μ in diameter, ellipsoid, oval, or rounded, mostly intercalary chlamydospores, occasional oval, piriform, or roundish aleuriospores, roundish, double-contoured cells, isolated or in groups, sometimes enclosed in a very delicate sac and possibly representing asci with ascospores, and 'fuseaux', mostly 4- to 6-celled and in some cases falciform and reminiscent of *Fusarium* spores. A superficial resemblance to *Microsporon ferrugineum* [*R.A.M.*, xvi, p. 747] is apparent in the species under discussion, which does not, however, produce vermiculoid colonies or form pectinate bodies. The camel-skin fungus, which appears to be identical with an organism isolated by the writer during the Abyssinian campaign from two native camel attendants suffering from ringworm, is provisionally named *T. dankaliense* n.sp.

Sporotrichum anglicum n.sp., isolated from two cases of chronic bronchitis (once in association with *Monilia* [*Candida*] *pseudotropicalis*), makes good growth on glucose agar and other laboratory media, e.g. potato and carrot. On the first-named the colonies are whitish or

greyish, rugose, and covered with a very short, white 'duvet'. In hanging-drop cultures the abundant hyphae, sometimes furnished with many lateral denticules, range from 2 to 4 μ in diameter, and the numerous single or aggregated, oval conidia, borne on minute pedicels, average 4·6 by 3·5 μ, though the maximum longitudinal diameter may be only 3 μ in some cases and 7 μ in others. The fungus is Gram-positive, does not liquefy gelatine or serum or coagulate milk, but produces acid and gas from glucose and levulose and frequently also from maltose and saccharose, thereby differing from all other known species of *Sporotrichum*.

KANO (K.). **Über die Chromoblastomycose durch einen noch nicht als pathogen beschriebenen Pilz: Hormiscium dermatitidis n.sp.** [On chromoblastomycosis due to a fungus not hitherto described as pathogenic, *Hormiscium dermatitidis* n.sp.]—*Arch. Derm. Syph., Berl.*, clxxvi, 3, pp. 282–294, 5 figs., 1937.

Hormiscium dermatitidis, the agent of a facial dermatomycosis simulating tuberculosis verrucosa cutis in a 28-year-old Japanese woman [*R.A.M.*, xv, p. 502], was obtained in pure culture on 4 per cent. maltose agar and other media, producing on the former dull, coal-black, faviform colonies attaining a diameter of 8 mm. in 40 days and resembling mulberries in their protuberant shape and finely granular or plicate surface. In hanging-drop cultures on glucose peptone agar at 30° C. the fungus forms chains of variable shape, mostly consisting of ten or more oval (8 to 12 by 4 to 7 μ), round (10 μ in diameter), or elongated (5 to 12 or up to 20 by 3 to 5 μ) cells. Gemmae are present, mostly composed of round, thick cells with more slender, longer young cells at their apices. Bi- or occasionally trifurcate branching may take place apically, laterally, or at the junction of two cells. The rudimentary mycelia (best observed on a carrot medium) consist of more than ten segments of cells measuring 6 to 8 by 2 to 3 μ. The optimum temperature for the growth of the fungus is 20° to 30°, deterioration occurring at 37° and cessation at 43°. Animal and auto-inoculation experiments gave positive results.

FLINN (R. S.) & FLINN (J. W.). **Bronchomoniliasis.**—*J. trop. Med. (Hyg.)*, xl, 20, pp. 237–240, 4 figs., 1937.

Bronchomoniliasis [*R.A.M.*, xvii, p. 111], a widespread disease in the United States and elsewhere, is often not recognized, owing to confusion of the symptoms with those of pulmonary tuberculosis. Details are given of two cases associated with the presence in the sputum of *Monilia* [*Candida*] *pinoyi* [ibid., xvi, p. 811], and the opinion is expressed that the occurrence of this organism in the mouth is abnormal and calls for careful investigation.

WEEDON (F. R.), KENNEY (DOROTHY), & SHIRK (MARIE E.). **The incidence of Monilia albicans in routine sputum specimens.**—Abs. in *J. Bact.*, xxxiv, 6, pp. 657–658, 1937.

In view of the accepted association of *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvi, p. 748; xvii, p. 111] with inflammatory lesions in various sites, data were collected on the incidence of the yeast in the sputa

of 55 patients presenting symptoms of chronic pulmonary involvement. Of these specimens five contained *C. albicans*, and an extended series of similar observations is planned to determine the significance of this high incidence in relation to the clinical features of the associated pathological conditions.

GJESSING (H. C.) & MOSSIGE (K.). **Epidermophytosis: report of cases in three brothers, one of whom showed a hitherto undescribed clinical type on the scalp.**—*Arch. Derm. Syph., Chicago*, xxxvi, 6, pp. 1154–1157, 3 figs., 1937.

Epidermophyton inguinale [*E. floccosum*: *R.A.M.*, xvi, pp. 748, 810; xvii, p. 38] was isolated in Oslo, Norway, from the right foot, left ear, and scalp of one of three brothers, all of whom were suffering from various forms of epidermophytosis. If, as appears to be the case, the fungus was responsible for the extensive diffuse pityriasis observed, a new clinical type of the disease should be recognized under the name of pityriasis epidermophytica diffusa.

MORIKAWA (T.). **Granuloma trichophyticum Majocchi, hervorgerufen von Sabouraudites ruber (Castellani) (Trichophyton purpureum Bang).** [Granuloma trichophyticum Majocchi, caused by *Sabouraudites ruber* (Castellani) (*Trichophyton purpureum* Bang).]—*Arch. Derm. Syph., Berl.*, clxxvi, 3, pp. 265–281, 6 figs., 1937.

A full clinical, histological, and experimental discussion is given of a case of granuloma trichophyticum Majocchi, in a 29-year-old peasant woman. It is stated to be a very rare disease of which this is the first record in Japan. Two strains of the causal organism, *Trichophyton purpureum* [*R.A.M.*, xvi, p. 748] were isolated, one (A) from areas of superficial infection representing the typical form, and another (B) from deeper-lying sites, characterized by ill-developed, faviform cultures in which neither aleuria nor spindle spores were formed. Only the latter strain, together with *T. violaceum* [ibid., xvii, p. 38] and *T. faviforme album* [*T. album*: ibid., xvii, p. 244], was capable of inducing the characteristic deep granulomata in the patient and in laboratory animals, A causing only superficial trichophytosis.

SCHOOP (G.). **Salzpilz (Torula epizoa) auf Lebensmitteln.** [The salt fungus (*Torula epizoa*) on foodstuffs.]—*Dtsch. tierärztl. Wschr., 1937*, pp. 621–624, 1937. [Abs. in *Zbl. Bakt.*, Abt. 1 (Ref.), cxxviii, 9–10, p. 238, 1938.]

Torula epizoa [cf. *Sporendonema epizoum*: *R.A.M.*, xiii, p. 700], an obligate halophyte, was found forming rust-coloured to blackish-brown deposits on dried fish, bacon, ham, and sausages at the State Laboratory for Veterinary Analysis, Cassel (Germany). The best culture medium proved to be salt fungus agar plus 10 per cent. sodium chloride. Salt requirements and pigmentation vary in different strains of the mould.

GISSKE (H. W.). **Über die für die Verderbnis von in Kühlhäusern eingelagerten Eiern wichtigen Schimmelpilze unter besonderer Berücksichtigung des Schimmelpilzgehaltes der Kühlhausluft.** [On the moulds of importance in the spoilage of eggs in cold

storage, with special reference to the mould content of the atmosphere.]—Vet.-med. Diss., Hanover, 1937. [Abs. in *Zbl. Bakt.*, Abt. 1 (Ref.), cxxviii, 9–10, pp. 239–240, 1938.]

The following 11 moulds were detected in the atmosphere of a refrigerator used for the storage of eggs [cf. *R.A.M.*, xiv, p. 237] in Germany: *Penicillium glaucum*, *Cladosporium herbarum*, *Mucor racemosus*, *M. mucedo*, *Thamnidium elegans*, *Rhizopus elegans*, *Chaetostylum fresenii*, *P. brevicaule*, *M. pusillus* [ibid., xv, p. 297], *Verticillium* sp. [cf. ibid., xi, p. 641], and *Aspergillus candidus*. All species made macroscopically visible growth in three to five days at room temperature, but in the incubator *R. elegans* and *M. pusillus* were the only ones found to be viable after five days. Of seven species held at −2° C. *P. glaucum*, *M. racemosus* [ibid., xiii, p. 702], and *T. elegans* were still growing after 30 days. Bephol soap, a liquid disinfectant, applied to the cultures or sprayed through the atmosphere, was effective only against *P. glaucum*, *Cladosporium herbarum*, and *R. elegans* after two, three, and five days, respectively. *P. glaucum* and *M. racemosus* were the only species out of six grown in the presence of carbon dioxide to make slight growth after four days. Further experiments involving the exposure of fresh eggs to direct contamination by various atmospheric moulds showed that spoilage is mainly due to *P. glaucum*, *C. herbarum*, and *P. brevicaule*.

Rainio (A. J.). **Anthraknose der Agaven erzeugt durch Gloeosporium fructigenum Berk. (Colletotrichum agaves Cav. = Gloeosporium agaves Syd.)—Glomerella cingulata (Stonem.) Spauld. & Schr.** [Anthracnose of Agaves caused by *Gloeosporium fructigenum* Berk. (*Colletotrichum agaves* Cav. = *Gloeosporium agaves* Syd.)—*Glomerella cingulata* (Stonem.) Spauld. & Schr.]—*Valt. Maatalousk. Julk.*, 96, 20 pp., 2 pl., 1937. [Finnish summary.]

Agave americana plants transferred to a cool greenhouse (5° to 18° C.) at Helsingfors in the autumn of 1935 were observed to be affected by a disease terminating in foliar chlorosis and dying-off of the plants. The under, and later also the upper leaf surfaces bore dark green spots, turning brownish and finally dirty grey with age. The lesions (produced also by artificial inoculation) were covered only by the convex cuticle of the leaf, the eventual rupture of which liberated aggregations of conidia of a fungus which agreed with the published descriptions of *Colletotrichum agaves* [*R.A.M.*, vi, p. 341].

On oat agar no setae were formed, and the fungus presented the characters of a *Gloeosporium*; no doubt the occasional absence of these organs in nature led to Sydow's classification of the fungus as *G. agaves* (Index universalis, 1898). On meat broth agar, however, setae were produced. It is apparent that setae are not an integral part of the fungus but develop in response to certain nutritional factors; hence they cannot properly be used to transfer the organism from *Gloeosporium* to *Colletotrichum*, and pending further studies (which might involve a reclassification in the genus *Trullula* on the basis of the concatenate conidia) the use of the name *G. agaves* is recommended. After numerous unsuccessful attempts, the formation of the perfect

stage of *G. agaves* was induced by the inoculation of pure cultures on oat agar with a suspension of *Pseudomonas hyacinthi*. The perithecial stage would appear to belong to *Glomerella cingulata*.

MYERS (W. M.). **The nature and interaction of genes conditioning reaction to rust in Flax.**—*J. agric. Res.*, lv, 9, pp. 631–666, 3 pl., 1937.

After briefly referring to Flor's recent paper on physiologic specialization in *Melampsora lini* (*J. agric. Res.*, li, pp. 819–837, 1935) [cf. also *R.A.M.*, xv, p. 804], the author gives a tabulated account of field and greenhouse investigations from 1934–6, inclusive, in Minnesota, in an attempt to determine the nature and mechanism of inheritance in flax of reaction to physiologic form 4 of flax rust (received from Flor), and to a collection of the rust obtained at University Farm, Minnesota. The test material consisted of 37 crosses involving 17 varieties and strains of flax, which were experimentally shown to vary from complete immunity both in the field and in the greenhouse (Ottawa 770 B, Newland, C.I. 188, Minnesota, C.I. 438, and one strain of Bolley Golden) to susceptible (Pale Blue and Abyssinian Yellow); C.I. 649 gave a mixed reaction varying from resistant to semi-resistant. The immunity of Ottawa 770 B in the field was conditioned by a single dominant factor. In general, the reaction of all the hybrids studied to form 4 and to the rust collection was similar, immunity being dominant to near immunity, resistance, and susceptibility, and resistance being dominant to semi-resistance and susceptibility. The behaviour of the hybrids of Ottawa 770 B, Newland, C.I. 438, C.I. 416–3, and C.I. 712 is explained by assuming factors in two different allelic series, *L* and *M*. These are duplicate factors conditioning immunity; l^n and m^n condition near immunity, l^n being allelic to *L* and m^n allelic to *M*; l^r and m^r condition resistance, l^r being allelic to *L* and l^n, and m^r allelic to *M* and m^n. On this hypothesis, the genotype of Ottawa 770 B is *LL mm*; Newland, *ll MM*; C.I. 438, *LL* m^rm^r; C.I. 416–3, *ll* m^nm^n; and C.I. 712, l^rl^r *mm*. The probable genetic constitution of the other flax varieties involved in the crosses is further discussed on the same lines.

JENKINS (ANNA E.). **Coryneum microstictum on Rose from Oregon.**—*Mycologia*, xxix, 6, pp. 725–731, 2 pl., 1937.

The results of the author's comparative morphological and cultural studies of *Coryneum microstictum* on rose from Oregon [*R.A.M.*, xiv, p. 172] showed that its conidial measurements were essentially the same as those on rose from the eastern part of the United States, but were somewhat larger than those from Canada and England. In pure culture the Oregon fungus differed from the eastern one only in its colour, and was also similar to an authentic culture of *C. microstictum* var. *mali*. The conidia produced by the two United States strains in pure culture were often larger than those produced in nature, sometimes containing as many as seven cells. Two strains of *C. beijerinckii* [*Clasterosporium carpophilum*] (from Oregon and Europe, respectively) were also included in the studies; the one from Oregon in pure culture produced few-celled and relatively short conidia, whereas in the one from Europe the conidia were usually longer and sometimes up to seven-celled.

Prevention of Antirrhinum rust.—*Egypt. Mail, 1937*, 7956, 1937.

Preliminary experiments carried out by the Mycological Section of the Ministry of Agriculture, Egypt, indicate that *Antirrhinum* [*majus*] rust [*Puccinia antirrhini*] may be controlled in that country [*R.A.M.*, xvi, p. 387] by spraying with 0·5 per cent. colloidal sulphur and 0·25 per cent. household soap, the first application to be made immediately symptoms of infection appear and the treatment to be continued at two- to three-weekly intervals throughout the season. Either the Avon (W. J. Craven & Co.) or sulsol brands of colloidal sulphur may be used.

Gadd (C. H.). **A disease of Salvias.**—*Trop. Agriculturist*, lxxxix, 6, pp. 335–338, 1 pl., 1937.

The results of experiments briefly described in this paper showed that disease symptoms on *Salvia farinacea* in Ceylon, suggestive of virus infection, are caused by attacks of a Capsid bug (*Lygus viridanus*).

West (E.). **Witches' broom of Oleander.**—*Pr. Bull. Fla agric. Exp. Sta.*, 2 pp., 1937.

Witches' broom of oleander (*Nerium oleander*) in Florida is caused by a species of *Sphaeropsis*. The brooms originate in buds on the stem, and when several of the larger canes are attacked the bush assumes a stunted appearance and ceases to produce flowers. The fungus, which is not apparent in living brooms, now produces numerous black pustules near the bases of the small dead twigs. The pustules in due course exude large numbers of minute, oval, black spores. Control measures recommended consist in the pruning out of all brooms, including 12 in. of the branches on which they were growing, followed by the application of some good copper fungicide equivalent to Flordo spray [*R.A.M.*, xvii, p. 51] or 3–3–50 Bordeaux mixture. The prunings should be carefully collected and burned to prevent the dispersal of spores.

Ferraris (T.). **Un Oidio su la Stapelia europaea Guss. (Oidium acrocladum Ferr. n.sp.).** [A species of *Oidium* parasitic on *Stapelia europaea* Guss. (*Oidium acrocladum* Ferr. n.sp.).]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xiv, 1–4, pp. 41–44, 2 figs., 1937.

A description [with Latin diagnosis] is given of a species of *Oidium* considered to be new to science and named *O. acrocladum*, which in 1937 was observed in a glasshouse near Verrua Savoia, Piedmont, causing a white soft rot of the young stem tips of potted plants of *Stapelia europaea*. The fungus forms globose haustoria, unbranched, septate conidiophores measuring 100 to 110 by 7 μ, and conidia in long chains, the apical one oval, rounded, 29 to 31 by 17 to 19 μ, and the remainder truncate at both ends, 21 to 24 by 12 to 14 μ.

Taubenhaus (J. J.) & Altstatt (G. E.). **A decay of ornamental Cacti caused by Aspergillus alliaceus.**—*Mycologia*, xxix, 6, pp. 681–685, 1 pl., 1937.

An account is given of a serious outbreak in 1933 of a rot of the cladodes of ornamental cacti in south-west Texas, caused by *Asper-*

gillus alliaceus [*R.A.M.*, xiii, p. 559], this being apparently the first record of the organism causing a decay of cultivated plants in the United States. Inoculation experiments indicated that *A. alliaceus* was pathogenic to the cacti, and also to several species of mature fruits and vegetables, only when the spores or the sclerotia were introduced through needle punctures. Effective control was obtained by spraying with Bordeaux mixture.

JENKINS (ANNA E.). **Distribution of Rose anthracnose in California.**—*Plant Dis. Reptr*, xxi, 17, pp. 316–317, 1 pl., 1 map, 1937. [Mimeographed.]

Rose anthracnose (*Sphaceloma rosarum*) [*R.A.M.*, xii, p. 95; xiii, p. 493; xiv, p. 678] is reported to have occurred at San Diego, California, severely attacking the Silver Moon variety, about the year 1932, and a little later at Guadeloupe, Santa Barbara county. In 1937, it occurred on dooryard and garden roses in several other localities in California, namely Riverside, San Marino (where the George Arends variety was severely affected, the lesions attaining a diameter of 7 mm.), San Francisco, Klamath, and Crescent City. In most of the new localities except San Marino it was practically the only disease in evidence.

Rust on Marigold in California.—*Plant Dis. Reptr*, xxi, 20, p. 374, 1937. [Mimeographed.]

African marigolds (*Tagetes erecta*) at San Juan, California, were found by J. B. Kendrick and M. W. Gardner to be affected by a rust, identified by Dr. G. B. Cummins as *Coleosporium madiae* Cke. There appears to be no previous record of a *Coleosporium* on *Tagetes*.

KLINKOWSKI (M.). **Pilzkrankheiten und nichtparasitäre Schädigungen der Luzerne.** [Fungous diseases and non-parasitic injuries of Lucerne.]—*Kranke Pflanze*, xiv, 12, pp. 201–205, 1937; xv, 1, pp. 6–9, 2 pl., 1938.

Semi-popular notes are given on a number of fungous and non-parasitic diseases affecting lucerne in Germany [cf. *R.A.M.*, xvi, p. 816], including white stippling [ibid., xii, p. 765], a disturbance in water relations due to frost or potash deficiency; downy mildew (*Peronospora aestivalis*) [*P. trifoliorum*: see above, p. 301]; mosaic [ibid., xvi, pp. 113, 518]; leaf spots (*Pseudopeziza medicaginis* [ibid., xvii, p. 44], *Macrosporium* [*Thyrospora*] *sarcinaeforme* [ibid., xvi, p. 754], *Ascochyta medicaginis* [ibid., xi, p. 654], *Pyrenopeziza medicaginis* [*Pseudopeziza jonesii*: ibid., xiv, p. 494], and *Septoria medicaginis* [ibid., vi, p. 101]); rust (*Uromyces striatus*) [loc. cit. and ibid., xvii, p. 44]; true mildew (*Ersyiphe pisi* f. sp. *medicaginis-sativae*); hollow crown, probably due in the first place to mechanical breakage of the stem intensified by frost damage; stem rot (*Sclerotinia ciborioides*) [*S. sclerotiorum*: ibid., xvii, p. 252]; wilt (*Fusarium* [? *trifolii*: ibid., xvi, p. 754]), occurring in a severe form chiefly during the heat of summer and in warm, dry situations; crown wart (*Urophlyctis alfalfae*) [ibid., xvi, p. 563]; anthracnose (*Colletotrichum trifolii*) [ibid., xiii, p. 382; xvii, p. 44], a recent introduction into the country which is

assuming a virulent character; and violet root rot (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*: ibid., xvii, p. 44].

WATERHOUSE (W. L.). **A note on the ascigerous stage of Claviceps paspali S. & H. in Australia.**—*Proc. Linn. Soc. N.S.W.*, lxii, 5–6, p. 377, 1937.

In 1935 a serious outbreak of ergot (*Claviceps paspali*) [*R.A.M.*, xvi, p. 36] occurred in south-eastern Australia on *Paspalum dilatatum* and other species of *Paspalum*, the sphacelial and sclerotial stages being observed throughout the area, though the ascigerous stage has not previously been reported in Australia. Mature sclerotia from *P. dilatatum* were collected in March 1936, sown on the surface of soil in pots, and covered lightly with sand and plant debris, afterwards being alternately frozen [cf. ibid., xvii, p. 104] and thawed until September, after which the pots were kept on the floor of a plant house and the soil occasionally watered. The first signs of germination were noted in October, 1937, and the production of the perfect stage had continued profusely since that date. There would appear to be no reason why natural weathering should not bring about the production of the perfect stage of *C. paspali* in the field. Ascospore production in nature may perhaps be an important factor in dissemination and in giving rise to new physiologic races.

CHRISTOFF (A.). Вирусните болести по овощните дървета. [Virus diseases of fruit trees.]—*Publ. Bulg. Pl. Prot. Service* 29, 23 pp., 21 figs., 1937.

This is a very popular account, specially written for the information of the local small growers, of the chief virus diseases of fruit trees and shrubs in Bulgaria, most of which have already been noticed in this *Review* from other sources.

PLAGGE (H. H.) & MANEY (T. J.). **Factors influencing the development of soggy breakdown in Apples.**—*J. agric. Res.*, lv, 10, pp. 739–763, 6 figs., 1 graph, 1937.

The authors report the effects of storage temperature, picking maturity, short and long pre-storage delays, and aeration on soggy [low temperature] breakdown in apples [*R.A.M.*, xvi, p. 688], according to the results of their observations carried out over eleven years in Iowa. Apple varieties from the same orchard in different years and from different orchards in the same year exhibit marked differences in susceptibility to soggy breakdown. The optimal storage temperature for Jonathan, Northwestern Greening, Wealthy, Winter Banana, Golden Delicious, and Grimes Golden appears to be 36° F. Jonathan proved to be less susceptible to soggy breakdown when rather overmature on the picking date, but the contrary is true for the Northwestern Greening. It is suggested that susceptibility is associated with the stage of respiratory activity attained by the fruit at the time it is placed in storage.

Prompt storage after picking causes greater susceptibility in Jonathan, Northwestern Greening, and Winter Banana and greater resistance in Grimes Golden, Wealthy, and Golden Delicious. Long delays

of 5 to 10 weeks at 50° before storing produced a marked resistance in Jonathan, Grimes Golden, Winter Banana, Northwestern Greening, and, to a less degree, in Golden Delicious.

Aeration in storage of wrapped fruit packed in boxes or unwrapped fruit in wire baskets proved to be an unsatisfactory means of control for soggy breakdown. Colour and size of fruit appear to influence the susceptibility only to a very small extent; Jonathan with 100 per cent. colour in storage at 30° is less resistant than fruit of the same maturity with only 25 to 50 per cent. colour; Northwestern Greening of a full yellow colour is less resistant than leaf-green fruit. In most of the tested varieties of apples the size of the fruit is of little consequence, except for Northwestern Greening, large fruits of which appear to be more susceptible to soggy breakdown than small.

A rather definite period of development of soggy breakdown is indicated, ranging from about 12th December to 15th February in Grimes Golden, and from 15th November to 1st February in Jonathan.

THOMAS (P. H.). **Treatment of tree wounds.**—*Tasm. J. Agric.*, N.S., viii, 4, pp. 180–184, 4 figs., 1937.

The writer states that *Polystictus versicolor* [*R.A.M.*, xvi, p. 106] is a prevalent wound parasite in Tasmanian orchards. It attacks mature trees more severely than young ones, kills the bark and cambium, and causes serious injury.

Recent experiments on apple trees have shown that treatments with bitumen emulsion [ibid., xvii, p. 187] and glycerine-mercuric compounds (glycerine 3 qts., water 1 qt., mercuric chloride and cyanide ¼ oz. each) give the most satisfactory control. The experimental treatments were applied towards the end of the dormant period (August 1935) before the commencement of spring growth. The glycerine-mercuric mixture was applied to wounds after the excision of diseased tissue and trimming. Two applications at an interval of about 21 days proved successful even in the worst cases.

MORWOOD (R. B.). **Little leaf of the Apple.**—*Qd agric. J.*, xlviii, 6, pp. 673–678, 4 figs., 1937.

Zinc injections into the shoots of apple trees in Queensland affected by little leaf [*R.A.M.*, xvi, pp. 682, 817] having stimulated a slight but favourable response, a further test was made in which affected and unaffected Lalla and Jonathan apple trees were given an autumn application of a mixture consisting of 10 lb. zinc sulphate and 5 lb. hydrated lime per 100 galls. water, an average amount of 4/5 gall. being given per medium-sized tree. The following spring the sprayed Lalla trees were observed to show much healthier growth than the unsprayed controls; of the sprayed trees only the portions most severely affected during the previous season had failed to show complete recovery, while in the unsprayed plots trees previously affected showed more severe symptoms, and many hitherto unaffected trees showed a considerable amount of little leaf. Some evidence of control was observed in Jonathan. As even one year's delay in the application of control measures may be attended by serious results, growers are advised to spray their trees while in full leaf with a mixture made by

dissolving 8 lb. commercial zinc sulphate in about 70 galls. water and adding 4 lb. hydrated lime dissolved in 4 galls. water while stirring, the mixture then being made up to 80 galls.

KIENHOLZ (J[ESS] R.) & CHILDS (L.). **Twig lesions as a source of early spring infection by the Pear scab organism.**—*J. agric. Res.*, lv, 9, pp. 667–681, 1 fig., 5 graphs, 1937.

The authors state that observations in 1934 and 1935 in the Hood River Valley of Oregon, where pear scab (*Venturia pirina*) [*R.A.M.*, xvi, p. 797] has become a serious limiting factor in the production of pears since 1932, indicated, in agreement with R. W. Marsh's findings in England [ibid., xiii, p. 36], that the number of primary infections on pear trees early in the spring is closely correlated with the amount of twig infections in the orchard. In 1934, which was marked by a long and dry growing season, most of the lesions occurred at the base of the current season's twigs, indicating that infection had taken place soon after they started growth; such lesions were sloughed off or became inactive before the trees became dormant, and the majority failed to produce conidia the following spring. During years with shorter growing seasons and more rainfall, the pear trees appeared to be unable to slough off incipient infections, with the result that practically all the lesions remained active and produced spores the next spring. These data were confirmed by observations on the effects of spraying during four years in commercial orchards, which showed that where twig infections were absent, pear scab was relatively easy to control, even in the presence of plentiful ascospores (detected by spore traps) from overwintered leaves. The fact that conidia were found to be dispersed before bud tissues are exposed, causing twig infections before the ascospores are mature, indicates that early sprays should be timed by conidial dispersion from twig lesions, where these occur. It was further shown that consistent and thorough spraying during the growing season largely prevented twig infections, and that in the district surveyed early season applications were more important for the control of both twig and fruit scab, because more precipitation occurred early in the season, and because a certain amount of host resist ancebecame apparent after that time. Lime-sulphur was effective in 'burning out' active twig pustules, but was injurious to young, tender-skinned fruits, for which reason it was dangerous if applied after the bud scales had dropped; when applied in the delayed-dormant stage, however, it allowed additional sprays to give satisfactory control against reinfection by keeping down the number of primary spores.

KEITT (G. W.), BLODGETT (E. C.), WILSON (E. E.), & MAGIE (R. O.). **The epidemiology and control of Cherry leaf spot.**—*Res. Bull. Wis. agric. Exp. Sta.* 132, 117 pp., 7 figs., 21 graphs, 1937.

Field, laboratory, and greenhouse studies, carried out in Wisconsin since 1914 with only two seasons' intermission, on the leaf spot (*Coccomyces hiemalis*) of sour cherry (*Prunus cerasus*) [*R.A.M.*, xvi, pp. 544, 696] are described in detail with special reference to its development and control in relation to environmental factors and its prevention under partially controlled conditions. On agar gel in Petri dishes the

conidia failed to germinate in 48 hours at 4° C., germination being very sparse at 8°, and greatly retarded at 12°, best at 16° to 28°, and falling off rapidly to the upper limit of about 32°. Germ-tube elongation was quickest at 20° to 28°. Nearly 50 per cent. ascospore germination occurred at 4° in 48 hours, germ-tube elongation being greatly retarded at 4° and 8°, much quicker at 12°, and greatly favoured by temperatures of 16° to 28°. Ascospore germination was slight at 30° and totally inhibited at about 32°. Continuous wetting was the best moisture relation for spore germination, and little resistance was shown to desiccation after germination.

When potted Montmorency cherries were artificially infected with conidia in the greenhouse initial infection was expedited by the following temperatures in decreasing order: 20°, 16°, 24°, 12°, 28°, and 8°. Most of the lesions became macroscopically visible in 5 to 8 days at 20° or 28° and in 8 to 11 days at 12°. The amount of infection that developed was much reduced when the moist period after inoculation was broken by air-drying the plants for brief periods after spore germination had begun, but before major infection took place. Considerable infection was initiated in darkness or diffused light, but the amount of infection was not greatly influenced by 'length of day' or intensity of illumination. Prolonged darkness before and after infection reduced the incidence of the disease. Very young leaves were resistant, but became susceptible when the folded halves began to separate, and mature leaves were highly susceptible.

Isolates from *P. cerasus*, *P. avium*, and *P. mahaleb* cross-infected freely on these hosts, but isolates from *P. cerasus* and *P. pennsylvanica* did not cross-infect readily. No wild host appears to play any significant part as a source of inoculum locally. The only known type of natural overwintering is in the dead leaves as stroma-like bodies containing ascocarp initials. Ascospores appear to be the only important primary inoculum under natural conditions in Wisconsin, though apothecial conidia were found. Ascospore discharge took place only when the leaves were thoroughly wet, and became most copious after they began to dry. Very sparse at 1°, 4°, and 8°, it was rapid at 16° and over. Natural discharge generally began before blossoming and lasted six or seven weeks. Primary infection was sparse and its chief epidemiological importance was to re-establish the fungus on the host. Abundant conidial production followed infection under all conditions except high temperatures. No functional acervuli developed on plants held continuously at 28°. The lower temperatures at which lesions developed favoured sporulation and reduced necrosis, while the higher temperatures favoured necrosis and 'shot-hole' at the cost of sporulation. Atmospheric water was the chief agent of spread of the conidial inoculum. Secondary infection commonly occurred in successive waves due to specific infection periods. The critical period for development and control began when the secondary inoculum became available and continued until the leaves had ceased functioning.

In spraying and dusting tests the best control was given by Bordeaux mixture (3–4–50) and lime-sulphur (1 in 40) applied (1) just after petal-fall, (2) about two weeks later, and (3) just after harvest, with an additional application about two weeks after the second one in the

case of the lime-sulphur. The Bordeaux mixture gave better results than the lime-sulphur, both as regards disease control and improvement in the crop and condition of the trees. Improved orchard sanitation, beginning before infection started, was an effective supplementary control measure.

SUKHORUKOFF (K. T.) & NATALJINA (Mme O. B.). **On the harmfulness of anthracnose of Black Currant.**—*C.R. Acad. Sci. U.R.S.S.*, xvii, 1–2, pp. 73–76, 1937.

Observations on anthracnose (*Pseudopeziza ribis*) of black currant [*R.A.M.*, xv, p. 448], made by the authors in the field on four-year-old plants, by means of monthly analyses of two-year-old branches, showed that infection is followed by a drop of 30 to 32·6 per cent. in carbohydrates and of 28·5 to 33·4 per cent. in lipoids in the perennial parts of the plant in the autumn-winter period. The shortage of these main nutrient reserves in the diseased plant unfavourably influenced growth and lowered the yield by up to 52·8 per cent. Although the effect of anthracnose on the resistance of the black currant to frost has not yet been determined, there is reason to suppose that it lowers the winter hardiness of the plant.

GANTE (T.). **Zur Resistenzzüchtung gegen Pseudopeziza ribis Klebahn. I. Beitrag zur Kenntnis der Infektionsbedingungen und der Kultur des Pilzes.** [On breeding for resistance to *Pseudopeziza ribis* Klebahn. I. A contribution to the knowledge of the conditions governing infection and the culture of the fungus.]—*Gartenbauwiss.*, xi, 5, pp. 675–696, 7 figs., 1937.

The writer's inoculation experiments with *Pseudopeziza ribis* on gooseberries and currants [*R.A.M.*, xiii, p. 173; xvi, p. 756, and preceding abstract] carried out principally in the field at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, involved the use of Rudloff and Schmidt's method (*Gartenbauwiss.*, ix, p. 65; *Züchter*, vi, p. 288, 1934), whereby the test material is enclosed in cellophane bags lined with damp blotting paper with provision for the absorption of water from Erlenmeyer flasks. The period of exposure to these excessively humid conditions averaged four days. The temperature during the trials approximated to the optimum for *P. ribis*. Conidial suspensions of the fungus from pure cultures on yeast water plus 1 per cent. cane sugar were applied to the leaf surfaces by means of a paintbrush or atomizer. Infection took place chiefly through the under side. Leaves of all ages contracted anthracnose under the experimental conditions herein described, whereas in nature the older foliage is first attacked. Not only were the susceptible Large Red Cherry and Dutch White currants successfully inoculated in these tests, but also the normally resistant Dutch Red, Gondouin Red, and Erstling aus Vierlanden currants and the American Carrie and Houghton gooseberries. Spontaneous infection of such semi-resistant varieties may also occur late in the season; their utility for breeding purposes, however, is not impaired thereby, since such attacks virtually coincide with the normal period of defoliation.

Brief notes are given on two other diseases affecting currants and

gooseberries in Germany, viz., leaf spot (*Mycosphaerella ribis*) [*M. grossulariae*: *R.A.M.*, xiv, p. 774] and rust (*Cronartium ribicola*) [ibid., xvii, p. 281].

CHEESMAN (E. E.) & WARDLAW (C. W.). **Specific and varietal susceptibility of Bananas to Cercospora leaf spot.**—*Trop. Agriculture, Trin.*, xiv, 12, pp. 335–336, 1937.

The authors state that recent surveys have indicated that high resistance to *Cercospora musae* leaf spot [*R.A.M.*, xvii, p. 191] is the rule among the important collection of wild banana species at the Imperial College of Tropical Agriculture in Trinidad, and that most of the hybrids bred from them at the College are quite free from leaf spotting. Of particular interest for the eventual development of a good export banana, resistant to the leaf spot, is the I.C. 2 hybrid, derived from the Gros Michel as the female and the wild seeded *Musa acuminata* as the male parent, which field observations in various parts of the island have shown to be very mildly susceptible, spotting occurring only on the oldest leaf; in leaves sent in for examination as being badly infected, the spotting was found to have been caused not by *C. musae* but by *Cordana* [*Scolecotrichum*] *musae* [loc. cit.], a weak parasite on senile leaves. Of the collection of cultivated banana types at the College, eight were found to be highly resistant to, or immune from, both *C. musae* and Panama disease [*Fusarium oxysporum cubense*]; they are, however, probably useless as parents of new varieties since they are not possessed of desirable commercial properties.

FERNANDO (M.). **A note on a soft rot of stored Mangoes caused by Botryodiplodia theobromae Pat.**—*Trop. Agriculturist*, lxxxix, 6, pp. 381–387, 1 pl., 1 graph, 1937.

A brief account is given of the author's investigation of a soft rot which developed in 1937 in stored Chembattan mangoes at the Farm School, Jaffna, and Peradeniya, the causal organism of which was found to be *Botryodiplodia theobromae* [cf. *R.A.M.*, xvi, p. 670]. Although this is stated to be the first record of the fungus causing a storage rot of mangoes in Ceylon, examination of decayed mangoes from the Municipal Market at Kandy showed that the disease is not as uncommon as at first thought, and two strains of *B. theobromae* were isolated from fruits of the Parrot and Papaw varieties. In 78 of the 97 Chembattan mangoes examined, infection had occurred through the stalk end. While the disease is essentially one of the ripe fruit, invasion of green fruits has also been occasionally observed. The strains from the Chembattan and the Parrot mangoes were experimentally demonstrated to be pathogenic to the fruits, and to secrete a vigorous protopectinase enzyme. Control measures for the trouble are briefly discussed.

LEWCOCK (H. K.). **Yellow spot disease of Pineapples.**—*Qd agric. J.*, xlviii, 6, pp. 665–672, 5 figs., 1937.

Pineapple yellow spot [*R.A.M.*, xvi, p. 114] was observed for the first time in Queensland in October, 1937, when an outbreak, confined to the tops of maturing fruit, occurred in a two-year-old planting in the Mary Valley. Most of the fruit had already been harvested, but

between 1 and 2 per cent. of the remainder were affected, mostly so severely as to be worthless. In Hawaii the disease affects young plants propagated from tops more commonly than it does the tops of maturing fruit, but no top plants of a susceptible age were found in the vicinity of the affected field.

Insufficient data are available to indicate the effect of local climatic conditions on seasonal incidence or the extent to which the disease may be expected to develop, but as spread in this first outbreak appeared to have been arrested some time before October, it appears probable that, as in Hawaii, the development of the disease will be considerably retarded during prolonged dry periods.

RUMP (L.). **Beitrag zur Frage der Dosierung von Trockenbeizmitteln für kleinste Mengen feiner Sämereien.** [A contribution to the problem of the dosage of dusts for small quantities of fine seed.]—*Z. PflKrankh.*, xlvii, 12, pp. 596–603, 1 fig., 1937.

In order to determine the requisite quantity of a fungicidal dust, e.g., ceresan UT 1875 *a*, for the treatment of small quantities of fine seeds, such as those of flowers and vegetables, the writer has devised the following procedure. A sample of seed weighing 5 gm. is shaken up with the dust in a short-necked, globular extraction flask of 25, 50, or 100 c.c. capacity for a minimum period of five minutes or until the maximum possible adhesion of the dust to the seed is obtained. The non-adhering residue of the dust is removed with a fine-meshed sieve and the seed weighed with the adhering dust. The difference between the original weight of the seed and that after treatment indicates the amount of dust adhering and this dose is designated 1/1. In the tests herein described 0·267 gm. ceresan adhered to 5 gm. white cabbage seed. Directions are given for the estimation of the half dose and smaller fractions by mathematical formulae. Details are furnished of laboratory experiments on the germination of seed treated with various quantities of ceresan calculated by the above-described method, the uniformity and exactitude of which are amply demonstrated.

SCHNICKER (J. L.). **Kemikaliekontrollen i 1937.** [Inspection of chemical substances in 1937.]—*Tidsskr. Planteavl*, xlii, 4, pp. 620–630, 1937.

Notes are given on the various offences against the Danish plant protective and poison laws detected in the course of the official inspection in 1937 of some 400 samples of fruit tree carbolineum, nicotine preparations, mercury-containing fungicides, lead arsenate, Bordeaux paste, and lime-sulphur [*R.A.M.*, xiv, p. 379]. Analyses are furnished of the contents of a number of fungicides (including some well-known preparations of international repute) and insecticides officially authorized by the Danish Plant Protection Service.

RECKENDORFER (P.). **Die chemischen Grundlagen der Wirkungsweise der Schwefelkalkbrühe.** [The chemical bases of the mode of action of lime-sulphur mixture.]—*Phytopath. Z.*, x, 3, pp. 306–331, 1937.

In this study on the fungicidal action of lime-sulphur [cf. *R.A.M.*, xv, p. 240] the author investigated the oxidation products obtained on passing purified atmospheric oxygen through the fungicide (10 c.c.

diluted with 200 c.c. distilled water). No visible sign of decomposition was evident until after 45 minutes, the decomposition taking place very slowly without any evidence of the formation of hydrogen sulphide. Whereas 100 c.c. of the original mixture contained 1·86 gm. thiosulphate sulphur, 11·87 gm. polysulphide sulphur, and 3·18 gm. monosulphide sulphur, after three hours' oxidation the values were 6·40, 1·92, and 0·36 gm., respectively. On the basis of these results the author deduces that the volume of oxygen required to oxidize 6 c.c. of the original mixture would be 3,000 c.c., which was passed through the apparatus in $\frac{1}{3}$ minute, so that lime-sulphur must be regarded as highly resistant to the action of oxygen. Until the polysulphides are extremely desiccated the mixture will resist oxidation and decomposition, but in the open, as the spray film dries, oxidation takes place with great rapidity and intensity. The analytical figures show that as the poly- and monosulphide sulphur decreases the thiosulphate sulphur increases and it is apparent that the polysulphide state (estimated as the quotient of polysulphide sulphur/monosulphide sulphur) increases from 3·73 to 5·33 after three hours, the molecular weight increasing from 4·73 to 6·33 during the same period. On the basis of the analytical data it is necessary to assume the existence of a polysulphide in the original mixture higher than $Ca(S)S_4$. According to equations given in full: (*a*) the decrease of polysulphide is greater than the increase of thiosulphate sulphur; (*b*) the decrease of monosulphide sulphur must be greater than half the increase of the thiosulphate sulphur; (*c*) the oxidation of polysulphide and monosulphide sulphur runs largely parallel, showing that the total decrease of both these compounds, which must be present in a minimum ratio of 3 : 2·5, must exceed the increase of thiosulphate sulphur. The author thinks he is justified in assuming that, in respect of the polysulphide content of lime-sulphur mixture, the molecular degree CaS_5 is not the highest possible total stage, and that a polysulphide with a larger series value than 4 can be confidently postulated.

In a further experiment involving the passage of air instead of oxygen, the results were similar but hydrogen sulphide was abundantly formed. The mixture became turbid owing to the colloidal character of the sulphur and the influence of carbon dioxide. The passage of pure oxygen and pure carbon dioxide combined resulted in only traces of hydrogen sulphide, while pure carbon dioxide alone caused such an immense output of hydrogen sulphide as to preclude an exact statistical evaluation of the decomposition data.

[An abridged account of these experiments appears in *Wein u. Rebe*, xix, pp. 111–119, 1937.]

Horsfall (J. G.), Marsh (R. W.), & Martin (H.). **Studies upon the copper fungicides. IV. The fungicidal value of the copper oxides.**—*Ann. appl. Biol.*, xxiv, 4, pp. 867–882, 1 pl., 1 graph, 1937.

In this further instalment of this series [*R.A.M.*, xvii, p. 260] the authors give an account of studies on the relative merits of cuprous and cupric oxides as fungicides, based on the conception that the field performance of a protective fungicide is dependent on (1) factors determining the quantity (retention and tenacity) [ibid., xvi, p. 695]

of material present throughout the period of protection, and (2) factors which determine the relative fungicidal value of the residue; this value is the resultant of availability [loc. cit.], inherent toxicity (determined by the chemical nature of the agent responsible for fungicidal value), and the particular fungus and/or host plant concerned. The fungicidal values of various samples of cuprous and cupric oxides, as judged by their inhibitory effect on the germination of the spores of *Macrosporium* [*Thyrospora*] *sarcinaeforme* and *Cladosporium carpophilum*, were determined in the laboratory, using a standardized method [which is briefly described] of spraying suspensions of the materials on to glass slides, which were then dried in a desiccator; the spore suspensions, adjusted as nearly as possible to 20 per low power field, were placed on the dried slides, incubated at 27° C. overnight, and examined the following morning. The results indicated that within each series of cuprous or cupric oxides, the fungicidal value is dependent on the method of manufacture and the particle size, and that, allowance being made for these two factors, cuprous oxide inhibited spore germination to a greater degree than cupric oxide of equivalent copper content. If the inhibitive action of these oxides is due to the formation of soluble copper derivatives, the greater fungicidal value of the cuprous over the cupric oxides may be explained both by the readier solubility of cuprous oxide in certain solvents (greater availability) and the greater potency of the active fungicide produced from cuprous oxide (greater inherent toxicity).

SCHNEIDERHAN (F. J.). **Preparation and properties of Bordeaux mixture.**—*Bull. W. Va agric. Exp. Sta.* 283, 30 pp., 11 figs., 1937. [Abs. in *Exp. Sta. Rec.*, lxxviii, 1, pp. 57–58, 1938.]

The data obtained from tests conducted with Bordeaux mixtures made from 43 different formulae indicated that instant Bordeaux mixture prepared from pulverized copper sulphate and high hydrated lime gives higher average suspensions than mixtures from stock solutions of copper sulphate and quicklime or from low hydrated lime. With both forms of lime from the same limestone the chemical hydrated form was of comparable activity to quicklime, as judged by its dispersion. In Bordeaux mixture (4–4–50) freshly prepared milk of lime gave a rather higher suspension than 15-days-old milk of lime.

Spherulites [spherical crystalline bodies], formed during the decomposition of the mixture, appeared in the 4–4–50 Bordeaux mixture after 75 hours at 23° to 25° C. The addition of 1·5 per cent. bentonite delayed their formation 28·5 hours, and when 0·5 per cent. of sugar or tannic acid was present as well they did not form in 15 days.

Colour-chart determination of 23 formulae indicated that no two are identical in colour; the highest suspension was correlated with the deepest blue shades, while mixtures of low copper sulphate concentration and high suspension were lighter than those of higher concentration and high suspension. The addition of lead arsenate at the rate of 3 lb., and of magnesium and calcium arsenate at that of 2·5 lb., per 100 galls. made no significant change in the suspension of the 4–4–50 mixture; the addition of bentonite, tannic acid, or sugar assisted suspension of this mixture after three hours.

Entoma: a directory of insect pest control.—142 pp., Eastern Br. Amer. Ass. econ. Ent., 1937.

This manual comprises, *inter alia*, information on some fundamental facts relating to the composition, preparation, and selection of insecticides for various purposes, lists of insecticides, fungicides, the ingredients used in their manufacture, and disinfectant machinery and supplies, together with the names and addresses of their makers.

Afanasiev (M. M.). **Method of isolating single hyphal tips of Actinomyces.**—*Phytopathology*, xxvii, 12, pp. 1182–1183, 1937.

The author describes in detail a method of isolating single hyphal tips of *Actinomyces* by touching the tip of a young aerial hypha with the point of a glass needle dipped in sucrose solution and attached to the substage of a microscope, and transferring the needle point, after microscopic examination, to sterile albumin agar in a Petri dish.

Schweizer (G.). **Einführung in die Kaltsterilisationsmethode.** [An introduction to methods of cold-sterilization.]—vi+80 pp., Jena, G. Fischer, [? 1937]. Price Rm. 5. [Abs. in *Zbl. Bakt.*, Abt. 2, xcvii, 9–13, p. 245, 1937.]

In many cases it is of the utmost importance both from the bacteriological and the mycological point of view to be able to use organic nutrient culture media which have been sterilized otherwise than by heat. The methods described in this manual consist mainly in the use of small quantities of volatile disinfectants and the intensification of their narcotic effects by negative pressure and simultaneous withdrawal of oxygen. One chapter is devoted to the description of a cold-sterilization apparatus, and there is a tabulated list of recommended disinfectants, their properties, and the uses for which they are particularly suitable.

Kultūraugu kaitēkļu, slimību un nezāļu apkarošana. [The control of insect, fungus, and weed pests of cultivated plants.]—207 pp., 88 figs., 2 diags., Latvian Plant Prot. Inst., 1937.

Notes are given on the symptoms and control of a large number of well-known pests and diseases affecting cultivated plants in Latvia.

Baudyš (E.). **Draslo jako prostředek k ochraně rostlin.** [Potassium as a plant protective.]—6th ed., 96 pp., 33 figs., Prague, 1937.

In this pamphlet the author gives a richly documented survey of research work on the importance of potassium for the health of plants. Special mention is made of experiments in Czechoslovakia, the results of which indicated that spraying potatoes with a 2 per cent. potassium salt solution (especially kainit) affords good control of leaf roll and late blight (*Phytophthora infestans*). Excellent control of vine mildew (*Plasmopara viticola*) was also reported from three localities by spraying the vines, which had previously severely suffered from the disease, with a 10 per cent. kainit solution. Many more examples are also cited of the controlling effect of potassium applications on a wide range of plant diseases and insect parasites, a full list of which is appended at the end of the volume.

Journées de la lutte chimique contre les ennemis des cultures. Paris 19–25 mai 1937. [Papers on the chemical control of crop pests and diseases. Paris, 19–25 May, 1937.]—*Chim. et Industr.*, xxxviii, 4 bis, 255+xiv pp., 39 figs., 1 graph, 1937.

This valuable compilation of papers on the chemical aspects of the control of plant pests and diseases read at a series of meetings held in Paris in May, 1937, and organized by the Société de Chimie Industrielle with the collaboration of the Société de Pathologie Végétale et d'Entomologie Agricole de France includes, among many others, papers on cupric dusts (by Vinas), copper oxychlorides (Desrue and Lucain), casein Bordeaux mixture (Masselin), sulphur and its derivatives (Duprez), black sulphur (Granjon), natural sulphur (Lugan), colloidal sulphur (Lahaze), wettable sulphur and sulphide (Duprez), sulphur derivatives (Duprez), potassium permanganate (Schuppon), formalin (Chaux), vine mildew (*Plasmopara viticola*: by Marsais), the powdery mildews [which are listed] (Monchot), fungous diseases of peach and apricot (Joëssel), virus diseases of fruit trees (Dufrénoy and Bruneteau), and the chemical protection of timber against disease and decay (Lutz). Practically all the points dealt with have already been noticed in this *Review* from time to time.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1936.** [A bibliography of plant protection literature for the year 1936.]—392 pp., Biol. Anst. (Reichsanst.) Berl., 1937.

This bibliography of German and foreign literature published during 1936 on various aspects of plant protection has been prepared on the usual lines [*R.A.M.*, xvi, p. 266].

Best (R. J.). **The chemistry of some plant viruses.**—*J. Aust. chem. Inst.*, iv, 10, pp. 375–392, 1 fig., 2 graphs, 1937.

In this paper, read at the conference of the Australian Chemical Institute held at Adelaide in May, 1937, the author discusses, with references to the relevant literature, some chemical aspects of plant and animal viruses, including tomato spotted wilt and tobacco mosaic. He concludes that there is no sharp break between living and non-living matter, and that viruses may be regarded as living molecules, of graded complexity of structure and organization, bridging the gap between the architecture of the larger non-living chemical molecules and that of the simplest living cell.

Smith (K. M.). **Some aspects of the plant virus problem.**—*Publ. Smithson. Instn* 3431, pp. 345–352, 2 pl., 1 fig., 1937. [Reprinted from *Rep. Smithson. Instn, 1936*, 2 pl., pp. 345–352, ? 1937.]

This is a reprint of a paper already noticed from another source [*R.A.M.*, xv, p. 455].

Ulbrich (E.). **Ergebnisse neuerer Forschungen über die Mykorrhiza.** [Results of recent studies on mycorrhiza.]—*S. B. Ges. naturf. Fr. Berl., 1936*, 4–7, pp. 253–274, 1937.

This is a review of some recent outstanding researches on the nature and distribution of tree mycorrhiza, with special reference to the

numerous familiar edible and poisonous fungi pursuing this symbiotic mode of existence in German forests.

HIROE (I.). **Experimental studies on the saltation in fungi parasitic on plants.**—Reprinted from *Mem. Tottori agric. Coll.*, v, 1, 272 pp., 25 pl., 8 figs., 2 diags., 1937. [Japanese, with English summary.]

This is a comprehensive, fully tabulated account of the writer's studies, covering a period of ten years, at the Tottori (Japan) Agricultural College, on the phenomenon of saltation in plant-parasitic fungi, with special reference to *Helminthosporium* and *Brachysporium* [*R.A.M.*, xv, p. 511]. Two types of sectorial saltation are recognized: A, in which the sectors appear white among the blackish parent mycelial colony; and B, characterized by the development of dark sectors on pale colonies and vice versa. Type A, represented by *B. tomato*, the agent of tomato leaf blight, was found to be of very rare occurrence and was unaffected by any artificial treatments. The saltants, though losing their colour completely, do not differ from their parents in morphological and cultural characters. Reversion to the parental forms has never been observed. In type B, exemplified by *Alternaria kikuchiana*, the causal organism of black spot of Japanese pear [ibid., xiii, p. 775] and *Ophiobolus miyabeanus*, isolated from rice [ibid, xvi, p. 632], saltation is relatively profuse and is influenced by artificial treatments. The saltants are not so uniformly constant as in type A, gradual or sudden reversion to the parent form being sometimes observed. Deviation from the parents is expressed not only in colour but also in morphological characters.

The island type of saltation resembles sector type B in the instability of the saltants, the marked response to artificial treatments, and the morphological divergences from the parent form, to which are added various physiological peculiarities. Representatives of the island type include *O. miyabeanus*, *B. ovoideum* on Italian millet [*Setaria italica*], *B. tomato*, *Helminthosporium oryzae-microsporum* n.sp. (*Trans. Tottori Soc. agric. Sci.*, v, p. 175, 1935) and *B. senegalense* [*R.A.M.*, xv, p. 511] on rice, and *B. capsici* on chilli [ibid., xiv, p. 344]. In the case of *O. miyabeanus* the development of island saltants on potato juice agar appears to be an extension of 'pseudomyceliosis' [ibid., xii, p. 584], which in turn is correlated with an intensification of oxidase activity in profusely saltating cultures.

In conclusion, it is stated that whereas in the case of sexual reproduction hybridization and segregation are the main causes of permanent variations in fungi, mutation or saltation is chiefly responsible for their origin in fungi which reproduce themselves vegetatively.

WEINDLING (R.). **Isolation of toxic substances from the culture filtrates of Trichoderma and Gliocladium.**—*Phytopathology*, xxvii, 12, pp. 1175–1177, 1937.

As pointed out by M. Timonin and confirmed by C. Thom, the fungus yielding a crystalline toxic substance in recent experiments with the culture filtrate is not a *Trichoderma* but a *Gliocladium* [*R.A.M.*, xvi, p. 268]. The most noticeable difference between the toxic effects of the culture filtrates of the two organisms lies in the superior stability

at room temperature of the *Gliocladium* substance, both culture filtrates and aqueous solutions of the crystalline body derived therefrom remaining active for several days in an acid reaction. Both the original *Gliocladium* used in the studies from Californian soil, and other isolates of the fungus from *Gerbera* roots in New York State producing the crystalline toxic substance appear to belong to Thom's floccose-green series and agree fairly well with Gilman and Abbott's description of *G. fimbriatum* in their summary of soil fungi [ibid., vii, p. 57].

HANSEN (H. P.). **Studier over Kartoffelviroser i Danmark.** [Studies on Potato viruses in Denmark.]—*Tidsskr. Planteavl*, xlii, 4, pp. 641–681, 6 figs., 1 graph, 1937. [English summary.]

A detailed, fully tabulated account is given of the writer's studies on potato viruses in Denmark [*R.A.M.*, xvi, p. 705], the symptoms of the various disorders being described as they occur in some standard commercial varieties. Sydens Dronning [Southern Queen] is predominantly affected by an acute form of leaf drop streak. Virus E was found in a plant showing rugose mosaic symptoms, which were also induced on the same host by greenhouse inoculations with the virus. Aucuba mosaic and leaf roll were also observed in this variety, which may further serve as a carrier of X, though reacting to A by top necrosis [ibid., xvi, p. 53]. A form of rugose mosaic caused by virus Y was observed to be prevalent in Bintje, reducing the average yield by 60 per cent. in two years' tests. Ordinary (X) mosaic and leaf roll also affect this variety, and its yield was reduced by about one-third, due to extensive infection by giant hill. Bintje acts as a vector of virus E and sometimes also of X and A. Rugose mosaic (Y), leaf roll, and giant hill are the most common disturbances of King Edward, while Direktor Johanssen suffers from ordinary mosaic, a form of leaf drop streak caused by viruses X and Y [ibid., xvii, p. 265], and leaf roll, reacting to virus A by ordinary mosaic symptoms.

Antisera active against viruses Y, A, and X were prepared, the crude green juice generally being used as recommended by Chester [ibid., xvi, p. 767]. The precipitin in anti-X serum, derived from tobacco juice infected with a mild strain of X from an Up-to-Date potato plant, was completely absorbed by crude X virus juice but not by that from a healthy plant. The anti-X serum proved to be a reliable diagnostic reagent for virus X in the juice of tobacco, *Datura stramonium*, tomato, and potato; in the case of the last-named all the 69 plants tested reacted correctly, irrespective of variety, presence or absence of viruses Y, A, or E, and nature of the symptoms displayed. Top necrosis failed to induce any reaction with crude juice, whether the disease was caused by virus X (as in King Edward and Epicure) or A (Up-to-Date and Southern Queen). The anti-X precipitin succumbed to ten minutes' heating at 80° C. but not at 70°, the process of dissolution apparently coinciding with serum coagulation.

The reactions obtained with anti-Y serum in crude juices containing the Y virus were less clearly defined than those induced by anti-X, but an improvement in this respect was effected by the use of a constant temperature bath maintained at about 40° instead of room tempera-

ture. Both viruses Y and A reacted similarly with anti-Y precipitin, the potato varieties used in this test being Bintje (externally healthy and with rugose mosaic), King Edward (externally healthy), and Juli (crinkle). The precipitin was completely absorbed by potato juice containing either Y or A, but not by that of healthy plants. The two viruses, when occurring in combination in the potato, were further shown to maintain their individual characteristics unchanged, both as regards effect on the host and relation to juice inoculation. These two infective principles failed to confer reciprocal immunization on Up-to-Date and Juli potatoes [ibid., xvi, p. 704 *et passim*], thereby refuting Birkeland's theory that serological relationship and the capacity for a mutually protective action in the host are necessarily correlated [ibid., xv, p. 671].

The preparation of maps showing the distribution of the various potato virus diseases in Denmark is advocated together with further studies on varietal reaction and reduction in yield due to viruses. Particulars are given of the methods employed in the production of virus-free tubers at the writer's 30-hect. farm near Copenhagen.

Folsom (D.) & Bonde (R.). **Some properties of Potato rugose mosaic and its components.**—*J. agric. Res.*, lv, 10, pp. 765–783, 6 figs., 1937.

Rugose mosaic of potato [*R.A.M.*, xvi, p. 481] is ascribed by the authors to at least two viruses, the pure rugose mosaic or veinbanding virus and the latent mosaic virus. Inoculation experiments on several thousand plants in some hundreds of series were made by the authors in Maine. The leaf-mutilation method was chosen for inoculating potato plants, and a method involving painting the inoculum on the leaves by wooden pot stakes for inoculating tobacco and *Datura stramonium*. The usual source of inoculum was stock of the Green Mountain potato and inoculated tobacco plants. Tomato was less satisfactory than tobacco and *D. stramonium* for inoculation experiments, and bean [*Phaseolus vulgaris*] was apparently immune. Extract from foliage was found to be more infectious than that from colourless sprouts, seed-tubers, and roots, the infectivity of the rugose mosaic virus being apparently correlated with the amount of chlorophyll present. The inoculum from young diseased potato plants was more infectious than that from old, whereas the age of diseased tobacco plants was of little consequence. Dried leaves of both plants were entirely non-infectious. Ageing *in vitro* up to 4, 6, or 8 hours progressively increased the infectiousness of rugose mosaic inoculum, while further ageing reduced it; under certain conditions the inactivation was complete after a few days. The latent mosaic virus sometimes resisted ageing longer than the pure rugose mosaic virus.

The thermal death point of the pure rugose mosaic virus, as well as that of the composite virus, lies at a temperature of 60° or 65° C., although it varies with different plants. For the latent mosaic, which is more persistent, the temperature must be raised to 90°. Rugose mosaic extract became inactivated at about 1 to 0·1 per cent. upon dilution with water. Healthy potato juice had a somewhat greater effect than water. Latent mosaic was more persistent than rugose. Pokeweed (*Phytolacca decandra*) juice inactivated rugose mosaic but

not latent mosaic. Filtration considerably reduced the virulence of the rugose virus, but only slightly affected the latent virus. For rugose mosaic the point of inactivation by hydrochloric acid and by sodium hydrate varied with conditions; it lay at over 50 per cent. for ethyl alcohol, at about 5 per cent. for sodium chloride, at about 0·5 per cent. for formaldehyde, at about 0·2 per cent. for hydrochloric acid, and at about 0·1 per cent. for copper sulphate and sulphuric acid cleaning fluid. Latent mosaic responded similarly to most of these chemicals, but was more resistant to formaldehyde and sulphuric acid cleaning fluid. The virulence of latent mosaic was not increased by eight successive passages through tobacco plants.

BLÜMKE. **Wie lässt sich der Kartoffelabbau bekämpfen?** [How can Potato degeneration be combated?]—*Mitt. Landw., Berl.*, lii, 49, pp. 1048–1050, 5 figs., 1937.

In connexion with a discussion of the possibilities of potato degeneration control in Germany [*R.A.M.*, xvi, p. 52], the writer emphasizes the importance of thorough roguing during May in order to forestall the transmission of infection from virus-diseased to healthy plants by leaf-sucking insects, of which probably the most important, at any rate in the central regions of the country, is the food bug (*Lygus pabulinus*). Under local conditions (Dessau) this insect does not appear in appreciable numbers before mid-June, the corresponding periods for the two other virus-liferous groups (leafhoppers and aphids) being the beginning and end of July, respectively. Another very necessary measure is the complete isolation of selected stocks preferably by rows of maize or, if this is not available, merely by fallow ground.

HEINZE (K.). **Zur Frage der Uebertragung der Kartoffelvirosen durch Jassiden.** [On the question of the transmission of Potato viruses by Jassids.]—*Phytopath. Z.*, x, 6, pp. 606–613, 4 figs., 1 graph, 1937.

Details are given of the writer's experiments at the Biological Institute, Dahlem, Berlin, in the transmission of infection from virus-infected to healthy potatoes by the widely prevalent Jassids, *Eupteryx atropunctata* and *Chlorita flavescens*. The insects were shown to be incapable of conveying the viruses from infected to sound plants, but they produced on certain varieties, e.g., Paul Krüger [President], injuries simulating those due to leaf roll, which were evidently mistaken by Elze (who reported the transmission of the disease by Jassids in Holland [*R.A.M.*, vii, p. 48]) for the genuine symptoms. A comparison of the plants suffering from pseudo leaf roll with those actually infected by the virus revealed fundamental differences, and moreover, the former condition was shown not to be transmissible to the progeny.

FRIEDRICH (H.). **Studien über die Zusammenhänge zwischen der Lagerungstemperatur gesunder und kranker Kartoffelknollen und dem Redoxpotential ihrer Gewebebreie.** [Studies on the relationships between the storage temperature of healthy and diseased Potato tubers and the reduction-oxidation potential of their pulped tissues.]—*Phytopath. Z.*, x, 6, pp. 559–577, 1937.

The potentials measurable by means of the platinum electrode in

pulped potato tissue (Wartenberg and Hey's method) [*R.A.M.*, xvi, p. 705] do not depend exclusively on the extent of degeneration, varietal characters, and stage of dormancy of the tubers, but also on the temperature at which the material has been stored prior to testing. Reliable differential data can therefore be secured by this method only if both diseased and healthy stocks have been kept under uniform temperature conditions.

The influence of storage temperature was apparent in all the four varieties recently tested at the Biological Institute, Dahlem, Berlin, viz., Erstling [Duke of York], Jubel, Centifolia, and Direktor Johanssen, but considerable variations were observed in the response of the individual varieties to this factor. For instance, a Jubel selection was found after five weeks' warm storage (18° to 22° C). in the laboratory to have advanced on an average by 64 millivolts towards the negative pole in comparison with similar material kept in a cellar at 4° to 8°. Under comparable conditions the change registered in Centifolia was only 11 millivolts. To a lesser extent, different lots of the same variety may react differently to the influence of high or low temperatures, but no such differences could be detected between healthy and degenerate tubers.

Almost exactly the same differences of potential between healthy and diseased tubers were observed in two separate experimental series, in one of which a constant potential was maintained for over two hours and in another for over three.

COCKERHAM (G.). **Potato flowers and dissemination of Potato viruses.**—*Nature, Lond.*, cxl, 3556, pp. 1100–1101, 1937.

In referring to the suggestion included in K. M. Smith's recent textbook on plant virus diseases [*R.A.M.*, xvii, p. 52] that the potato virus X may be distributed in the field by a species of thrips feeding in the potato flowers, the author points out that of the 14 potato varieties which flower sparingly or not at all in Scotland ten have been shown by analyses of samples to contain the virus rather commonly, while the remaining four are invariably free from it in the field; the latter react by necrotic lesions when artificially inoculated with the virus by grafting, but the former do not. None of the freely flowering commercial varieties is free from the virus and none responds to inoculation with it by necrosis. The author considers that these observations would indicate that the absence of virus X in a variety is more closely related to the necrotic reaction than to the absence of flowers. The necrotic disease is rarely, if ever, seen in the field, since, necrosis being lethal, the perpetuation of diseased plants in the field is eliminated. The results of infection experiments suggest that entry of the virus into varieties to which it is lethal does not readily take place otherwise than through a graft union. Further observations are also quoted indicating that the position with regard to virus A is very similar to that of virus X, and evidence is adduced from a series of controlled field trials showing that removal of the flower buds from potato plants did not reduce the spread in them of non-necrotic viruses distributed by aphids.

STARR (G. H.). **Potato seed-treatment studies in Wyoming, 1932–36.**—*Bull. Wyo. agric. Exp. Sta.* 222, 52 pp., 5 figs., 1937. [Abs. in *Exp. Sta. Rec.*, lxxviii, 1, pp. 63–64, 1938.]

In tests conducted in Wyoming from 1932 to 1936, in which healthy seed pieces of Bliss Triumph and Cobbler potatoes and seed infected with *Rhizoctonia* [*Corticium solani*] and scab [*Actinomyces scabies*] were submitted to various chemical treatments [cf. *R.A.M.*, xvii, p. 200], no treatment significantly increased the yield of the healthy seed, but when the yields in all the tests were averaged it was found that mercuric chloride, acid mercury, semesan bel, mercurnol, and acid formaldehyde increased the yields, while hot formaldehyde and formaldehyde dust considerably decreased them. All the treatments gave about the same slight degree of scab control. Acid mercury was rather more effective against *C. solani* than mercuric chloride. Taking all the treatments on all the seed they ranked in the following declining order of merit for the production of disease-free tubers: mercuric chloride, acid formaldehyde, acid mercury, mercurnol, hot formaldehyde, semesan bel, and formaldehyde dust, all giving considerably better results than in the controls. Pre-sprinkling, carried out only in one year's tests, gave favourable results. The dusts tested were less effective than the liquid treatments.

The amount of scab that developed under different soil moisture conditions [loc. cit.] was, on the whole, greater in the non-irrigated plots, the reverse, however, obtaining in the fertilizer plots.

Soil infestation by both organisms ranged from slight to heavy. Applications of inoculated sulphur, ammonium sulphate, superphosphate, and other fertilizers to irrigated and non-irrigated soil did not in general control infection, but ammonium sulphate slightly reduced scab in non-irrigated plots.

BLATTNÝ (C.). **Pokus o vymezení oblasti ČSR. podle vhodnosti pro pěstění Bramborové sádě.** [An attempt to classify the districts on the territory of the Czechoslovakian Republic according to their suitability for the production of Potato seed material.]—*Ann. Acad. tchécosl. Agric.*, xii, 5, pp. 683–688, 1 map, 1937. [German summary.]

On the map of Czechoslovakia accompanying this paper the author has marked the districts which direct experiments, as well as meteorological, biological, and ecological observations during a period of years, have shown to be most suitable for the production of healthy (virus-free) potato seed tubers. Intermediate degrees of fitness down to complete unfitness for such production are also indicated. Localities are marked which may be used for the production of seed tubers of very early varieties on a small scale. The rest of the territory is considered to be suitable only for the commercial or private growing of potatoes for immediate consumption. The author believes that Czechoslovakia has every prospect of developing an important production of satisfactory potato seed tubers, sufficient at least to set the Republic free from the necessity of importing planting material.

KATSURA (K.). **On the relation of atmospheric humidity to the infection of the Rice plant by Ophiobolus miyabeanus Ito et Kuribayashi and to the germination of its conidia.**—*Ann. phytopath. Soc. Japan*, vii, 2, pp. 105–124, 1937. [Japanese, with English summary.]

Rice seedlings inoculated with conidial suspensions of *Ophiobolus miyabeanus* [see above, p. 337] were kept in desiccators for 18 hours at a controlled temperature of 25° C. and varying relative humidities and then removed to a greenhouse bench. After five days typical symptoms of infection developed on the seedlings kept at 100, 97·5, 95, and 92 per cent. relative humidities for 18 hours, whereas those maintained at 89 per cent. for the same period remained quite healthy. Conidia of the fungus kept for 18 hours on slides in Petri dishes at 25° germinated at 92 but not at 89 per cent. relative humidity. From these data it would seem safe to assume that no infection of rice seedlings by *O. miyabeanus* takes place at a relative humidity below 89 per cent. and at 25° C.

KALIS (K. P.). **Tapproeven met twee sneden bij oculaties.** [Tapping experiments with two cuts on bud grafts.]—*Arch. Rubbercult. Ned.-Ind.*, xxi, 4, pp. 188–201, 1937. [English summary.]

The results [which are fully described and tabulated] of tapping experiments on *Hevea* rubber trees carried out on three plantations in Java for periods of 9 and 5 years and 16 months, respectively, showed no increase in the incidence of brown bast [*R.A.M.*, xvi, p. 557] in consequence of using two cuts instead of one, while the latex yield was augmented by 40 per cent. by the former method.

HEUBEL (G. A.). **Wondbehandeling bij Rubber.** [Wound treatment in Rubber.]—*Arch. Rubbercult. Ned.-Ind.*, xxi, 4, pp. 202–221, 10 figs., 1 diag., 1937.

Full directions are given for the treatment of wounds on *Hevea* rubber trees for the prevention of infection by *Botryodiplodia theobromae* [*R.A.M.*, xiii, p. 160] and *Ustulina zonata* [ibid., xvi, p. 798]. In a reclaimed area at the West Java Experiment Station *B. theobromae* caused the loss of 15 per cent. of the total number of bud grafts planted, while on another estate 30 per cent. were killed by the same pathogen, which enters the plant through the upper surface of the stump just above the grafting site. *B. theobromae* is particularly liable to infect bark scorched by exposure to intensely strong sunlight. *U. zonata* also penetrates bud grafts through stem stumps, causing complete decay of the wood below the wound and also of the tap-root in a case under observation. Small wounds should be covered with a thin layer of Product Socony 2295 A mixed with 3 to 5 per cent. pure carbolineum plantarium, while for larger ones the application of a mixture of asphalt 20/30 and 10 to 20 per cent. carbolineum plantarium is recommended.

LÖHNIS (MARIE P.). **Plant development in the absence of boron.**—*Meded. LandbHoogesch. Wageningen*, xli, 3, 38 pp., 13 pl., 1937.

The results of the writer's experiments [which are fully described,

tabulated, and discussed in relation to contemporary investigations on boron deficiency in agricultural crops] denote that this element is essential for the growth of angiosperms, of which lucerne, dwarf and runner beans (*Phaseolus vulgaris*), and eight varieties of peas proved to be particularly sensitive to the lack of the accessory substance. Cereals appear to constitute an exception to the general rule, developing profusely in a culture medium without boron. Their boron content, however, is very low under natural conditions [*R.A.M.*, xvi, p. 582; cf. xvii, p. 89]. Calcium deficiency was found to induce much the same type of injury as a shortage of boron. The latter element may be supplied by tourmaline in the absence of any other source.

WATSON (MARION A.). **Further studies on the relationship between Hyoscyamus virus 3 and the aphid Myzus persicae (Sulz.) with special reference to the effects of fasting.**—*Proc. roy. Soc.*, Ser. B., cxxv, 838, pp. 144–170, 4 pl., 1938.

In further studies on the relationship between the virus Hy. III and the insect vector *Myzus persicae* [*R.A.M.*, xvi, p. 332], in which the insects were starved for different periods before and after feeding on the source of infection, it was found that the number of healthy tobacco plants infected was greatly increased when infection feeding, i.e. the feeding on infected plants, was immediately preceded by fasting; the efficiency of *M. persicae* as a vector of the virus increased rapidly during the first hour of fasting, but long fasting periods resulted in little increase in infectivity. The greater efficiency so induced decreased with protraction of the infection feeding period, and after one hour's feeding on the infected leaves aphids subjected to a preliminary fast gave no greater infection than others fed continuously.

After infection feeding had ceased the aphids lost their infectivity, the rate of loss being probably faster than the rate of deterioration of the virus *in vitro*. This loss of infectivity was complete in about one hour when the aphids were not given a preliminary fast before infection feeding, or when fed on an intermediate healthy plant between infection feeding and the infection trial; when the aphids fasted before and after the infection feeding loss of infectivity was slower.

Infectivity became increased after two or more equally long successive infection feedings, unless the insects were induced, as described above, to lose their infectivity between the feedings. The infectivity acquired at a second or third infection feeding was generally less than that acquired at earlier feedings, the difference being least after long fasting followed by very short feeding periods.

When the same preliminary fasting conditions operated during successive infection trials, some aphids consistently showed greater ability to transmit the virus than others, but when the preliminary fasting was varied, so that the aphids fasted and fed continuously, at alternate infection trials, no individuals showed any consistent superiority in transmission. This indicates that two factors connected with fasting govern infectivity, of which one, probably the less effective, is 'appetite'.

These results can be explained on the assumption that during transmission from plant to plant the virus comes into contact with some

inactivating substance, probably trypsin, the chief proteolytic enzyme found in the stomach of insects, in which enzyme production generally ceases during starvation. There is, at present, no evidence to show how the virus comes into contact with trypsin in the body of the insect, but a parallel can be drawn between the partial inactivating effect, *in vitro*, of small quantities of trypsin acting for long periods, and the prolonged infectivity of insects fasted immediately after a short infection feeding.

B[ELL] (A. F.). **Save P.O.J. 2878!**—*Qd agric. J.*, xlviii, 9, pp. 714–718, 4 figs., 1937.

Growers of sugar-cane in southern Queensland, especially in the Moreton area, are urged to take immediate steps to prevent any spread of Fiji disease [*R.A.M.*, xvii, p. 66], lest the cultivation of the susceptible but otherwise highly desirable P.O.J. 2878 cane should have to be abandoned. The cane contains one-eighth wild blood, which confers resistance to gumming [*Bacterium vasculorum*: loc. cit.] and mosaic, but at the same time renders it susceptible to Fiji disease. It is recommended that growers should plant only healthy cane from healthy farms, dig out diseased stools by November–December, cease to ratoon diseased crops, take extra care in areas where the growth conditions are very good, plant resistant varieties in fields adjacent to those where the disease has become established, and watch for the appearance of infection on neighbouring farms.

B[ELL] (A. F.). **Sooty mould on Sugar Cane in the Babinda district.**—*Qd agric. J.*, xlviii, 6, pp. 724–725, 1937.

During the past two years sugar-cane in the Babinda area of Queensland has been widely affected by sooty mould which, though generally confined to old leaves, is found on the young leaves of canes stunted by inadequate drainage, infertile or highly acid soils, and chlorotic streak [fourth disease: *R.A.M.*, xvi, p. 561]. The sooty mould causes still further stunting. The remedy thus lies in the prevention of the initial stunting.

HANSFORD (C. G.). **Annotated host list of Uganda parasitic fungi and plant diseases. Part IV.**—*E. Afr. agric. J.*, iii, 3, pp. 235–240, 1937.

This further instalment of the author's list of parasitic fungi and plant diseases so far recorded in Uganda is on the same lines as the preceding ones [*R.A.M.*, xvi, p. 838], and includes hosts belonging to 13 families.

Rhizoctonia [*Corticium*] *solani* and *R. bataticola* [*Macrophomina phaseoli*] cause damping-off of *Coffea arabica* nursery seedlings. The disease, which may spread rapidly through the affected beds, is favoured by overcrowding and damp conditions; in the absence of these factors, it may be avoided. *R. lamellifera* is common on dead and dying coffee roots, especially on the fine branches. *Fusarium sporotrichioides* was isolated from the stamens of coffee flowers that refused to open normally and remained sterile. Inoculation tests gave negative results.

Irenina glabra forms small black patches on the leaves, stems, and berries of *C. robusta*; though parasitic on the epidermis the fungus does no

appreciable harm. *Hemileia vastatrix* is unimportant on *C. robusta*, and the site of the original rust infection is sometimes surrounded by dark brown spots due to penetration of the leaf tissue by *Cephalosporium* sp.

Other records include sunflower (*Helianthus annuus*) leaf spot (*Cercospora pachypus* Ell. & Kell.); *Colletotrichum nigrum*, *Vermicularia capsici* [ibid., xi, p. 545], and *Gloeosporium piperatum* on chillies (*Capsicum annuum*), attacking the fruit, through which they tend to invade the stems, causing considerable die-back in severe cases, which are, however, rather rare; and downy mildew (*Peronospora lamii*) of sweet basil (*Ocimum basilicum*), which caused such mortality at Kampala that the cultivation of the host (for the extraction of essential oil) was abandoned.

Nattrass (R. M.). **A first list of Cyprus fungi.**—xvi+87 pp., 15 pl., 1 graph, 2 maps (1 col.), Nicosia, Cyprus Department of Agriculture, 1937.

This list of 351 fungi collected in Cyprus from 1931 to 1937 is preceded by a brief account of the geographical configuration, climate, and natural and cultivated vegetation of the island. The new species proposed (with Latin diagnoses) are *Alternaria cichorii* on living leaves of chicory, *Hendersonula cypria* on a branch of apricot, *Phaeodothis hyparrheniae* on leaves of *Hyparrhenia hirta* Stapf., *Phyllachora ravennae* on leaves and sheaths of *Erianthus ravennae*, *Sporocybe cypria* on the bark of *Populus nigra*, and *Uromyces aeluropodis-repentis* on leaves, sheaths, and culms of *Aeluropus repens* Parl. and *A. littoralis* (Gm.) Parl. *Uromyces vesicatorius* (Bubák) and *Microdiplodia warburgiana* (Reichert) are proposed as new combinations, the synonym of the latter being *Diplodia warburgiana* Reichert.

A. cichorii n.sp. is identical with an undescribed species of *Alternaria* recorded on chicory in Florida by Weber. It resembles *A. crassa* (Sacc.) Rands [*R.A.M.*, xiii, p. 597], but differs in having frequently branched beaks and being non-pathogenic to *Datura* sp. It differs from *A. solani* (Ell. & Mart.) Jones & Grout in the somewhat smaller size of the conidia, in having longer and more slender beaks, and in being non-chromogenic in culture. It is non-pathogenic to both potato and lettuce, while neither *A. crassa* nor *A. solani* appears to be able to infect chicory. The conidiophores measure 25 to 28 by 6 to 12 μ, and the elongate, oval or fusoid, obclavate conidia, measuring 60 to 130 by 14 to 20 μ, are provided at the apex with a filiform beak, up to 280 by 2 to 3 μ, which is frequently branched.

Attention is drawn to the fact that *Synchytrium endobioticum* and a number of other important parasitic fungi have not yet been recorded in Cyprus.

Castellani (E.) & Ciferri (R.). **Prodromus mycoflorae Africae orientalis italicae.** [A first instalment of the mycoflora of Italian East Africa.]—153 pp., Florence, Ist. agric. colon. ital., 1937.

This is an annotated list, preceded by a ten-page bibliography, of the fungi so far recorded from Italian East Africa [*R.A.M.*, xvi, p. 279], which number 683 species distributed among 256 genera. Thirty-one of the species on eight hosts included in the compilation were observed

by the writers for the first time, while a further five species were detected on new hosts. Six new combinations are made, four of which involve the transference of species of *Trabutia* on *Ficus* spp. to *Phyllachora*. Fungus and host indexes are appended.

FISCHER (E.). **Ueber einige von E. Gäumann in Java und Celebes gesammelte Ustilagineen und Uredineen.** [On some Ustilagineae and Uredineae collected by E. Gäumann in Java and Celebes.]—*Ber. schweiz. bot. Ges.*, xlvii, pp. 419–424, 1937.

This is a critically annotated list of two Ustilagineae and twelve Uredineae collected by E. Gäumann in Java and Celebes from 1919 to 1922, including *Sorosporium reilianum* on sorghum [*R.A.M.*, xvi, p. 598], *Aecidium mori* on mulberry (*Morus indica*) [ibid., xii, p. 396] (both in Celebes), and three new species, two of *Aecidium* and one of *Uredo*, with Latin diagnoses.

COKER (W. C.), MATTHEWS (VELMA D.), & BARNHART (J. H.). **Blastocladiales, Monoblepharidales: Blastocladiaceae, Monoblepharidaceae. Saprolegniales: Saprolegniaceae, Ectrogellaceae, Leptomitaceae. Bibliography.**—*N. Amer. Flora*, ii, 1, pp. 1–76, 1937.

This is a comprehensive, critically annotated list of 13 species belonging to four genera of the Blastocladiaceae and of seven in the one genus (*Monoblepharis*) of the Monoblepharidaceae (by W. C. Coker); 80 species comprised in 15 genera of the Saprolegniaceae, three in two of the Ectrogellaceae, and 11 in five of the Leptomitaceae (by W. C. Coker and Velma D. Matthews), all occurring in the U.S.A. A seven-page bibliography, compiled by W. C. Coker and J. H. Barnhart, is appended.

LAVROV [LAVROFF] (N. N.). **Tilletiaceae novae vel rarae Unionis Soveticae.** [New or rare Tilletiaceae in the Soviet Union.]—*Animad. syst. Herb. Univ. tomsk.*, xi, 1, pp. 1–4, 1937.

This is an annotated list of 16 species of smuts collected by the author on the territory of the U.S.S.R., eleven of which are described as new to science [with Latin diagnoses], and two as new varieties. The following two fungi may be mentioned as occurring on hosts of economic significance, namely: *Entyloma korshinskyi* n.sp. on living leaves of *Hordeum distichum* var. *nutans* from Asia Minor, and *E. camusianum* P. Har. var. *pratense* n.var. on *Phleum pratense* from West Siberia.

HIRATSUKA (N.). **Miscellaneous notes on the East-Asiatic Uredinales with special reference to the Japanese species, I, II, III.**—*J. Jap. Bot.*, xiii, 4, pp. 244–251; 8, pp. 587–594, 1937; xiv, 1, pp. 33–38, 1938.

The following are among the records contained in this critically annotated list of eastern Asiatic (mainly Japanese) Uredinales [cf. *R.A.M.*, xvi, pp. 63, 411], [the new species of which are furnished with Latin diagnoses]. *Chrysomyxa tsugae* n.sp. produces on the twigs of *Tsuga sieboldii* in Honshû, Japan, orange to reddish-brown teleutosori, 1 to 9 mm. in length, 0·4 to 0·9 mm. in width, and up to 0·6 mm. in height, and forms chains, 150 to 290 μ long, of oblong to square,

smooth, hyaline teleutospores, 18 to 42 by 8 to 14 μ. *Pileolaria pistaciae* Tai & Wei (*Sinensia*, iv, p. 108, 1933) occurs on *Pistacia chinensis* in Formosa—a new addition to the Japanese mycoflora. *Chrysanthemum frutescens* is a new host for *Puccinia heeringiana* Kleb. *Melampsora arctica* is found on *Salix aquilonia*, *S. subreniformis*, and *S. yezoalpina*, its alternate host being *Saxifraga exilis* [*R.A.M.*, xvi, p. 492]. *Picea excelsa* and *P. jezoensis* are infected by *Barclayella deformans* (*Chrysomyxa abietis*) [ibid., xvi, p. 357]. *Pucciniosira clemensiae* Arth. & Cumm., a new record for Japan, occurs on *Berberis kawakamii*, a new host for the fungus. *Aecidium niitakense* n.sp. on *B. morrisonensis* is characterized by small groups of epiphyllous subepidermal, reddish, later nearly black spermogonia, 100 to 150 μ in diameter; few (2 to 24) hypophyllous, shortly cylindrical aecidia, 200 to 280 μ in diameter with irregular, mostly subrhomboid peridial cells, 30 to 48 by 20 to 33 μ, furnished with a verrucose-striate outer wall, 6 to 10 μ in thickness, and a densely verrucose inner one, up to 6 μ in thickness; and globose, subglobose, or obovate, densely verrucose, subhyaline aecidiospores, 18 to 27 by 15 to 23 μ, with an epispore 1 to 1·5 μ in thickness.

Garrett (A. O.). **The Uredinales or rusts of Utah.**—*Bull. Utah Univ.*, xxviii, 7, (Biol. Ser., iv, 1), 81 pp., 8 pl., 1937.

This is an annotated list of 185 rusts collected in Utah during the last 34 years, preceded by a key to the 15 genera occurring in the State and followed by fungus and host indexes.

Rick (J.). **Polyporaceae riograndenses.** [Polyporaceae of the Rio Grande.]—*Broteria*, vi, 4, pp. 153–168, 1937.

Latin descriptions are given of 44 Polyporaceae from the Rio Grande Valley, Brazil, including two new species [*R.A.M.*, xiv, p. 333].

Rick (J.). **Poriae riograndenses.** [Poriae of the Rio Grande.]—*Broteria*, vi, 3, pp. 128–150, 1937.

Latin descriptions are given of 75 species of *Poria* from the Rio Grande Valley, Brazil, including eight new ones.

Servazzi (O.). **Su due nuove Pestalotia.** [On two new species of *Pestalotia*.]—*Boll. Lab. sper. R. Oss. Fitopat., Torino*, xiv, 1–4, pp. 32–39, 2 pl., 1937.

A morphological and cultural account [without Latin diagnoses] is given of two species of *Pestalozzia* considered to be new to science, viz. *P. paeoniae* isolated in 1936 from leaf spots on *Paeonia arborea*, and *P. photiniae* in 1937 from similar spots on *Photinia arbutifolia* in Turin.

Bitancourt (A. A.). **Novas especies de Sphaceloma sobre Terminalia e Genipa.** [New species of *Sphaceloma* on *Terminalia* and *Genipa*.] —*Arch. Inst. biol. Def. agric. anim., S. Paulo*, viii, 13, pp. 197–200, 2 pl., 1937.

Diagnoses are given in Latin and Portuguese of *Sphaceloma terminaliae* n.sp., producing numerous pulvinate to crateriform lesions, 0·5 to 6 mm. in diameter, ranging in colour from dark livid, warm

blackish- or clove-brown to vinaceous pinkish-buff according to site, on the leaves and fruits of *Terminalia catappa*; and of *S. genipae* n.sp., forming dry, circular or elongated, carrot-red, pecan-brown, vinaceous-buff, or Natal brown spots on the foliage of *Genipa americana*, causing rugosity and distortion. *S. terminaliae* is characterized by black, erumpent acervuli, 20 to 200 μ in diameter, and dark, coalescent conidiophores, 15 to 25 μ in height, bearing continuous or uniseptate, hyaline, ovate, or elongated conidia, 10 to 15 by 4 to 6 μ. The white or grey, circular or elongated, erumpent acervuli of *S. genipae* measure 20 to 200 by 10 to 20 μ, and the oblong, pale yellow conidiophores, 10 to 20 μ in width, bear continuous, hyaline, globose, or oval conidia, 3 to 6 by 3 μ, and similar microconidia, 0·5 to 2 μ in diameter.

Couch (J. N.). **A new fungus intermediate between the rusts and Septobasidium.**—*Mycologia*, xxix, 6, pp. 665–673, 1 pl., 27 figs., 1937.

An account is given of a fungus found in South Carolina overgrowing dead scale insects (*Aspidiotus* sp.) on the bark of several deciduous trees in association with *Septobasidium* sp. The organism apparently combines to a remarkable degree some of the characters of the rusts and of *Septobasidium*, in that its spore forms strikingly resemble those of certain rusts, while in its parasitism on scale insects it resembles *Septobasidium*. A new genus, *Uredinella*, is erected for this fungus, which is named *U. coccidiophaga* n.sp., [with Latin diagnoses].

Dodge (B. O.). **The perithecial cavity formation in a Leptosphaeria on Opuntia.**—*Mycologia*, xxix, 6, pp. 707–716, 2 pl., 1937.

The author discusses at some length the formation of the cavities in the perithecia of a fungus which he found associated with *Hendersonia opuntiae* [*R.A.M.*, v, p. 303] on segments of *Opuntia lindheimeri* from Texas, collected by Wolf and deposited in the Herbarium of the New York Botanical Garden. A description is given of the organism, which is considered to be new to science and is named *Leptosphaeria opuntiae* [with diagnoses in English and Latin]. The perithecia measure 150 to 300 μ in diameter, the cylindrical, rather thick-walled asci 70 to 90 by 12 to 15 μ, and the olivaceous-brown, 3-septate ascospores 17 to 20 by 5 to 6·5 μ, the middle cells of the ascospores are larger than the end cells and are sometimes divided by a longitudinal wall. Numerous ascocarps of this fungus were also found in a specimen labelled '*H. opuntiae* E. & E.' from Alabama in the Ellis Herbarium.

Tobacco breeding bibliography.—19 pp., Imperial Bureau of Plant Genetics, School of Agriculture, Cambridge, 1937. [Mimeographed.]

In this bibliography of some 150 titles of papers (mostly recent), a number of the references, which are arranged in alphabetical order of authors, relate to diseases or abnormal conditions of the crop.

Kostoff (D.). **Cytogenetic aspects for producing Nicotiana tabacum forms localizing Tobacco mosaic virus.**—*Phytopath. Z.*, x, 6, pp. 578–593, 1937.

The problem of breeding tobacco varieties immune from mosaic for

the cigar and cigarette industry is greatly complicated by the absence of any immune (as distinct from resistant) forms within the species *Nicotiana tabacum*. The question thus arises whether the immunity from mosaic inherent in certain other *N.* spp. is transferable to *N. tabacum*, in connexion with which five points should be taken into account, namely, the immunity of the species, the ability to hybridize with *N. tabacum*, the extent of chromosome conjugation in *N. tabacum* species hybrids, the fertility of these species hybrids, their response to the mosaic virus, and the inheritance of this response.

Discussing the available information in respect of the reaction of *N.* spp. (numbering over 45) to the mosaic virus, the writer points out the importance of environmental conditions in the development of a particular type of response. *N. glauca* leaves, for instance, which readily contract mottling in the field at the Krasnodar (U.S.S.R.) Tobacco Institute, do not show this symptom in the greenhouse at Leningrad or Moscow. *N. sylvestris*, and, to a slighter degree, *N. longiflora*, *N. multivalvis*, *N. repandiformis*, and *N. tomentosiformis* react to infection by stunting and foliar mottling or even malformation. In most strains of *N. suaveolens* infection by the mosaic virus is not followed by mottling or distortion of the foliage, whereas in *N. sanderae* and *N. alata* some strains develop mottled leaves and others possess the capacity (probably conferred by intercrossing with *N. langsdorffii*, or possibly by mutation) of localizing the virus at the site of infection or forming necrotic systems [*R.A.M.*, xvi, p. 213].

The *N.* species which cross most readily with *N. tabacum* are *N. sylvestris*, *N. tomentosiformis*, *N. tomentosa*, and *N. glauca*. The hybrids of *N. tabacum* with other species are generally self-sterile, though in exceptional cases seeds are obtainable from the crosses *N. rustica*×*N. tabacum*, *N. sylvestris*×*N. tabacum*, and *N. tabacum*×*N. tomentosiformis* when flowering in the field. Little prospect of transferring the 'necrotic' response from the hybrid partner to *N. tabacum* is afforded by crossing the latter with species of incompatible chromosome relationships.

No mottling has been observed during the last ten years in mosaic-infected field and greenhouse plants of crosses between *N. glutinosa* or *N. suaveolens* and *N. tabacum*, the response of *N. rustica*×*N. tabacum*, *N. tabacum*×*N. alata*, and *N. tabacum*×*N. sanderae* hybrids being variable, while all others react by more or less severe foliar mottling and distortion. The F_1 hybrid reactions to mosaic infection may be thus expressed: mottling and distortion ensue when both parents react by these symptoms, while when one parent reacts by the formation of necrotic lesions this behaviour is commonly, but not invariably, followed by the hybrids. Amphidiploid hybrids react in the same way as the F_1 hybrids from which they originate, whereas composite hybrids, containing the whole genoms from the component species, respond differently. Thus, the hybrids (*N. tabacum*×*N. glauca*)×amphidiploid (*rustica*×*tabacum*), having two whole *N. tabacum* genoms (mottling), one *N. rustica* genom (necrotic), and one *N. glauca* genom (mottling), formed mottled leaves on infection by the mosaic virus. The F_1 *rustica*×*tabacum* and *rustica*× *glauca* hybrids, having one genom from a mottled type (*tabacum*×*glauca*) and one

from a necrotic (*rustica*), reacted to infection by the development of necrotic lesions, whereas the crosses (*tabacum*×*glauca*) ×amphidiploid (*rustica*×*tabacum*) produce mottled leaves, since one necrotic genom (*rustica*) cannot predominate over three of the mottling type (two *tabacum* and one *glauca*).

Some further theoretical considerations on the cytogenetics of tobacco crossing are advanced and discussed in relation to the practical aspects of breeding for the commercial purposes indicated above.

HILL (A. V.). **Big bud of Tobacco.**—*J. Coun. sci. industr. Res. Aust.*, x, 4, pp. 309–312, 1937.

Tobacco in New South Wales, Victoria, Queensland, and South Australia has been observed to show symptoms closely resembling those of tomato 'big bud' or bunchy top [*R.A.M.*, xiii, p. 62; xv, p. 406]. In 1936–7 16 per cent. of the plants in some fields in northern New South Wales were affected, though the quality of the leaf in many cases was not greatly impaired. As a rule, under 3 per cent. of the plants in individual fields are attacked. That the disease is caused by the same virus as that producing tomato big bud was indicated by successful grafting of scions of affected tobacco plants in the field on to a healthy tomato plant in the greenhouse, and by reciprocal grafts, the previously healthy plants developing typical symptoms in each case.

Scattered infections appear in the field in January, the affected plants being distinguishable at a distance by their recurved leaves hanging down close to the stem, the many small leaves present on shoots from axillary buds, and the proliferation and virescence of the flowering parts; they may reach only 1½ or 2 ft. in height. If the disease develops before topping, the leaves are usually worthless. The condition persists in overwintered plants, and appears on the new growth in the spring.

In the greenhouse the first symptom is a clearing of the small veins of leaves produced shortly after inoculation. The leaves hanging down round the stem may be distorted and twisted, the tips curving under and upwards. They become thick, brittle, and yellowish-green, and the upper surface is glazed. The leaves formed after infection are progressively smaller. In older leaves, necrosis of the veins, generally starting from the tips and margins, but sometimes chiefly affecting the midrib, appears as a network of dark lines.

Axillary buds develop early, and produce short shoots (some only 1 or 2 cm. long) with many small leaves. In the field, axillary shoots do not generally reach the flowering stage.

Flowers already formed when the virus reaches the inflorescence may appear normal, but the anthers and pistils usually fail to develop, and viable seed is seldom produced. The inflorescence generally develops numerous short branches. The flowers developing after invasion of the inflorescence are partially or completely virescent. In the field, the flower parts are generally virescent, and may be modified into leaf-like structures 5 cm. or more long. The calyx is frequently enlarged and bladder-like, and the floral axis may extend and proliferate into short branches with small leaves. The excessive development of short branches and the proliferation and virescence of the flowers result in a compact, tufted habit of growth.

STANLEY (W. M.). **A comparative study of some effects of several different viruses on Turkish Tobacco plants.**—*Phytopathology*, xxvii, 12, pp. 1152–1160, 3 graphs, 1937.

The viruses of tobacco, aucuba, masked tobacco, and green or yellow cucumber mosaics, severe etch [*R.A.M.*, xvii, p. 126], tobacco ring spot, and latent mosaic, inoculated under controlled conditions in the greenhouse into small, medium-sized, or large Turkish tobacco plants, cause stunting, but the two first-named stimulate protein metabolism to such an extent that the total protein production of the stunted plants exceeds that of the normal ones. All the other viruses used in the tests caused a decrease in total protein production. The extracts of plants infected by the tobacco or aucuba mosaic viruses were found to contain two or three times more protein nitrogen than those of normal material, due to the production of excessively large amounts (3 mg. per c.c.) of high molecular weight protein [ibid., xvii, p. 207], which appears to be closely correlated with the presence of intracellular crystalline deposits absent from individuals inoculated with the non-protein-increasing latent mosaic and ring spot viruses.

MANIL (P.). **Une forme nécrosante de la mosaïque du Tabac.** [A form of Tobacco mosaic producing necrosis.]—*Bull. Inst. agron. Gembloux*, vi, 3–4, pp. 186–190, 1 col. pl., 1937. [Flemish, German, and English summaries.]

Inoculations of tobacco plants in the greenhouse with a strain of tobacco mosaic obtained from plants showing necrosed symptoms in the field [cf. *R.A.M.*, xiv, p. 260] showed that it produced more severe symptoms than ordinary mosaic, the leaves becoming covered with large brown lesions and falling off. The white lesions seen in the field did not, however, develop. On *Nicotiana glutinosa* this strain produced only the symptoms of ordinary mosaic.

White Burley plants in the field were then inoculated with both ordinary and necrotic strains of the mosaic virus, with the X and Y viruses, the last two separately and together, with ring spot, with the A virus from potato, and with mixtures of each of the two mosaic strains with X and Y. Only the ordinary mosaic and the Y virus gave rise to systemic infection, the former giving typical symptoms of ordinary mosaic. The ring spot virus gave small, localized lesions. The X virus alone gave whitish spots on the inoculated leaf and those immediately above. Virus A gave no appreciable symptom. The mixture of mosaic with X gave the symptoms of both viruses, and of mosaic with Y only mosaic symptoms. X+Y gave veinbanding and a few X lesions. The strain of mosaic from the necrosed plants, however, gave symptoms exactly resembling those of the white necrotic spotting previously described [loc. cit.]. It is concluded that this spotting is, in most cases at least, due to a strain of ordinary tobacco mosaic, which may, it is considered, be the same as the strain reported in Thung's recent paper [ibid., xvi, p. 414] as causing a necrosed mosaic.

HEIERLE (E.). **Untersuchung einer unter dem Namen 'Rost' in der Schweiz stark verbreiteten Tabakkrankheit.** [A study of a Tobacco

disease very widely distributed in Switzerland under the name of 'rust'.]—*Ber. schweiz. bot. Ges.*, xlvii, pp. 363–368, 1 fig., 1937.

The name 'rust' is stated to be indiscriminately applied in Switzerland to several widespread tobacco leaf diseases (especially in Ticino), namely, wildfire (*Pseudomonas tabaci*) [*Bacterium tabacum*: *R.A.M.*, xvii, p. 274], angular leaf spot, and a potato virus transmissible to tobacco. The yellow-leaved varieties Mt. Calme jaune and White Burley are the most severely attacked.

The agents of both wildfire and angular leaf spot were isolated on a number of agar media, on which five different colony types developed, viz., (1) round, brown, with dark centre and pale halo, (2) round, uniformly brown, no halo, (3) round, brown, granular, no halo, (4) round, whitish, no halo, and (5) kidney-shaped, white. The microscopic examination of all the colonies revealed a Gram-negative, actively motile rod. In subcultures on beer wort agar, round, milky colonies were formed on the surface, with a more compact, oval to kidney-shaped growth in the submerged portion of the medium. Needle prick inoculation experiments on healthy plants with all types of colony resulted in the development of the characteristic wildfire lesions—olive-green to dark brown, concentric, 1 to 10 mm. in diameter, with a pale halo. In further tests with bacterial suspensions in sterilized tobacco juice at 20° C. and 90 per cent. relative humidity infected plants were killed within a fortnight. *Bact. tabacum* is thus evidently capable of producing either brown or white, angular spots on tobacco in the field according to environmental conditions [ibid., xvi, p. 566]. Observations on 30 varieties in eight localities in 1935 indicated that wildfire was prevalent only in areas that had been under tobacco for some years in succession. The entire absence of disease from one district, supplied like all the others with planting material from Zürich, shows that the stock was sound until infection was contracted in the field.

A virus disease of tobacco foliage characterized by indeterminate white spots without a halo is restricted to plantings in the vicinity of virus-infected potatoes.

No systematic attempts at the control of these diseases have yet been made, but it has been noted that neither wildfire nor the virus develop on tobacco near vineyards sprayed with Bordeaux mixture. Since it is safe to assume that *Bact. tabacum* is introduced on imported seed this should be disinfected with 1 per cent. silver nitrate, while in areas of long-standing tobacco cultivation the seed-bed soil should be sterilized by steam or chemicals.

CLAYTON (E. E.). **Water soaking of leaves in relation to development of the blackfire disease of Tobacco.**—*J. agric. Res.*, lv, 12, pp. 883–889, 5 figs., 1937 (issued 1938).

Details are given of experiments the results of which showed that tobacco leaves are readily infected by *Bacterium angulatum* [*R.A.M.*, xvii, p. 206], but that under ordinary conditions the progress of the parasite inside the invaded tissues is limited to small areas, large numbers of infections causing but little damage to most types of tobacco. The large, quickly developing lesions characteristic of epidemic blackfire were only produced on leaves that were sprayed with the bacterium

after watersoaking [ibid., xv, p. 537, and loc. cit.] for 48 hours or over; if, however, the watersoaked condition disappeared within a few hours after infection, the development of the disease was abruptly checked. Resistance of tobacco leaves to watersoaking and hence to blackfire was shown to be increased by high topping of the plants, as well as by low nitrogen and high potassium fertilizing.

The results secured in these experiments are similar in every way to those previously obtained with *Bact. tabacum*, but *Bact. angulatum* is evidently the less virulent parasite [cf. preceding abstract].

PAPE (H.). **Zur 'Farn- oder Fadenblättrigkeit der Tomate'.** ['On 'fern or thread leaf of the Tomato'.]—*Z. PflKrankh.*, xlvii, 12, pp. 619–620, 1 fig., 1937.

Referring to Kotte's recent description of fern leaf of tomato as a new disease for Germany [*R.A.M.*, xvi, p. 715], the writer states that the condition was observed at the Biological Institute, Dahlem, Berlin, on plants of the Lucullus variety as early as 1924, when both July and August were abnormally cool and the former also exceptionally wet.

BAUDYŠ (E.). **Kapradinovitost listů Rajských Jabliček.** [Tomato fern leaf.]—Reprinted from *Prakt. Rádce, 1937*, 10, 2 pp., 3 figs., 1937.

This is a popular account of tomato fern leaf [*R.A.M.*, xvii, p. 78, and preceding abstract] which is stated to have been very prevalent in Czechoslovakia in 1934 and 1935, frequently causing losses of 50 per cent. and more. Control measures are briefly indicated.

WENZL (H.). **Die Bakterienwelke der Tomaten in Österreich.** [The bacterial wilt of Tomatoes in Austria.]—Reprinted from *Landeskultur, 1937*, 12, 7 pp., 6 figs., 1937.

The writer's investigations in 1936–7 are stated to have shown that the destructive bacterial disease of tomatoes prevalent in Austria for some years past is due to *Bacterium* [*Aplanobacter*] *michiganense* [*R.A.M.*, xvii, p. 80], a semi-popular account of which is given, followed by a discussion of control measures. Several workers have emphasized the high incidence of infection occurring through the wounds inflicted in nipping off young shoots with the fingernail; local observations have further shown that the pathogen very frequently enters the plants through basal leaf scars, while in one instance field tomatoes were found to have been attacked through caterpillar injuries on the roots and stem bases. All varieties cultivated in the Vienna market-garden district appear to be highly susceptible to bacterial wilt, one of the most effective cultural measures against which is the production of hardy plants by the avoidance of excessive warmth and humidity in the early stages of growth.

PRITHAM (G. H.) & ANDERSON (A. K.). **The carbon metabolism of Fusarium lycopersici on glucose.**—*J. agric. Res.*, lv, 12, pp. 937–949, 4 graphs, 1937 (issued 1938).

The results of the studies described in this paper showed that the tomato wilt fungus, *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xvii, p. 139], is as tolerant in pure culture of extremes of hydrogen-

and hydroxyl-ion concentrations as *F. lini* [ibid., v, p. 441], and that the optimum P_H value for growth (4·1) is practically the same for the two fungi. *F. b.* var. *lycopersici* was further shown to have a decided tendency to change the P_H value of both acid and alkaline media towards the optimum, the final P_H in five cases varying only between 4·25 and 4·95. On glucose the organism produced, in addition to carbon dioxide and ethyl alcohol, considerable quantities of volatile and non-volatile compounds, presumably organic acids, part of the carbon in which was determined by new methods. The production of these compounds is an essential point of distinction between this organism and *F. lini* and *F. oxysporum* [ibid., xii, p. 531], probably due to differences in the biological characteristics of the three fungi. With *F. b.* var. *lycopersici* the ratio of the carbon in alcohol to carbon in carbon dioxide is very nearly that required by the equation for a typical yeast fermentation, but, owing to the consumption of the alcohol during the later periods of growth, the ratio gradually decreases with the age of the culture. Ethyl alcohol is definitely used by the fungus as a source of energy as soon as the glucose in the medium is exhausted, and can serve as the sole source of carbon; maximum growth is obtained at a concentration of alcohol approximating to the maximum amount produced on a glucose medium, but concentrations of 4 per cent. or more by volume seriously inhibited the growth of the fungus, and concentrations of 5 per cent. or more completely inhibited it. It does not seem likely that *F. b.* var. *lycopersici* produces alcohol in sufficient quantity to account for its wilting effect on tomatoes, as the maximum concentration obtained was 0·57 gm. per 100 ml.

BEDWELL (J. L.). **Twig blight of Asiatic Chestnuts, especially that caused by Phomopsis.**—*Phytopathology*, xxvii, 12, pp. 1143–1151, 1 fig., 1 graph, 1937.

The writer's investigation of 66,116 Japanese and 8,724 Chinese chestnut trees (*Castanea crenata* and *C. mollissima*, respectively) in 112 plantations in 22 States where they have been introduced to replace *C. dentata*, susceptible to blight (*Endothia parasitica*) [*R.A.M.*, xvi, p. 573], revealed serious damage due to twig blight in young stands, especially on unthrifty trees in poor sites or on those suffering from adverse climatic conditions or from wounds. In 1931 the disease was important in 73 per cent. of the plantations, heavily infecting (up to 90 or 100 per cent.) 56·2 per cent. of the Chinese and 45·2 per cent. of the Japanese trees and killing 13·1 and 12·9 per cent., respectively. The genera of fungi associated with the twig blight included *Phomopsis*, *Sphaeropsis*, *Diplodia*, *Cytospora*, *Diplodina*, *Macrophoma*, *Fusicoccum*, *Dothiorella*, *Phoma*, and *Epicoccum*. Affected trees present a scorched appearance due to the shrivelling and browning of the foliage. In the die-back form of the disease the fungus is arrested at the junction between the secondary shoot and the main stem, when the infected twigs, bearing small, black, erumpent pycnidia arranged singly or in groups, may rot at the base and fall off. In other instances sharply defined, dark to blackish-brown, elliptical cankers, up to 72 mm. in diameter, develop as a result of spread of infection or following injuries to larger branches. Some of these cankers deepen annually

with the formation of concentric zones of callus, and ultimately the branch or bole is completely girdled and dies.

The pathogenicity of pure cultures of two strains of *Phomopsis* (die-back and canker) from *C. crenata* in Virginia was demonstrated by inoculation of wounded Chinese and Japanese chestnuts in the greenhouse. Fifty-three per cent. of the inoculations were successful on dormant trees or those just about to resume activity and only 34 per cent. on those in full leaf, thus bearing out the observation that the period of most rapid growth of the fungus falls between 3rd March and 17th April under natural conditions. Both strains of the fungus were reisolated and produced pycnidia and both A and B spores in culture.

Control should be based on the planting of thrifty, sound stock on good sites, particularly avoiding frost pockets, maintaining vigorous growth by appropriate manuring, and avoiding cutting or pruning injuries.

Renoux. **Le Châtaignier du Japon au pays basque.** [The Japanese Chestnut in the Basque country.]—*Rev. Eaux For.*, lxxv, 12, pp. 998–1066, 2 figs., 1937.

Complete immunity from ink disease (*Blepharospora* [*Phytophthora*] *cambivora*) is stated to be manifested by the Tamba Guri and Shiba Guri varieties of Japanese chestnut (*Castanea crenata*) in the Basque region of Labourd, France [*R.A.M.*, xvi, p. 354].

Servazzi (O.). **Ulteriori prove di preservazione dalle muffe delle Castagne disinfestate con l'immersione in acqua a 50° C. per 45 minuti.** [Further researches on the preservation from moulds of Chestnuts disinfected by immersion in water at 50° C. for 45 minutes.]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xiv, 1–4, pp. 46–60, 2 figs., 4 graphs, 1937.

An account is given of experiments during 1935–7, the results of which showed that of all the chemicals tested toluene-p-sulphochloramide of sodium (commonly known under the name chloramide) and a preparation marketed under the designation 'euclorina' (Chemopharmaceutical Works Zambeletti, Milan), and also containing this substance, were the most effective in protecting Italian chestnuts, already disinfected for export by immersion for 45 minutes in water at 50° C., against the development of moulds [*R.A.M.*, xvi, p. 140]. It was shown that both chemicals afforded better control of the moulds when added to the cold water in which the chestnuts are placed to cool after treatment than when mixed with the hot water bath; commercial control was obtained with a concentration of 1 in 7,500.

Dowson (W. J.) & Callan (E. McC.). **The watermark disease in the White Willow.**—*Forestry*, xi, 2, pp. 104–108, 1 map, 1937.

White willows (*Salix alba* and '× *viridis*' = *S. alba* × *S. fragilis*) in Cambridgeshire being affected with a condition similar to the watermark disease of the cricket-bat willow (*S. caerulea*) in Essex caused by *Bacterium salicis* [*R.A.M.*, xvii, p. 81], inoculation experiments were made in which *Bact. salicis*, isolated from white willow, was inoculated

into four bat willows with positive results on two of the trees, from one of which the organism was recovered. When *Bact. salicis* from the bat willow was inoculated into two kinds of white willow, one tree of each kind developed severe infection, the organism again being recovered from one of the affected trees. From these results it is concluded that *Bact. salicis* from white willow can cause watermark in bat willow, and vice versa, and that the disease is the same in both kinds of willow and is due to the same organism.

The commonest willows in Essex are *S. caerulea*, while those most frequently found in Cambridgeshire are *S. alba* and its hybrids, many of which have long been diseased over a wide area. Bat willows recently planted in a few places have contracted the disease in the last few years, probably from adjacent white willows, the disease in which is thought to be indigenous in the area concerned; and not to have been derived from Essex. The danger of planting bat willows near affected white willows is obvious.

Hilborn (M. T.). **The anatomy of a black zone caused by Xylaria polymorpha.**—*Phytopathology*, xxvii, 12, pp. 1177–1179, 1 fig., 1937.

In 1933 all attempts to isolate the fungus responsible for the production of a black zone in a red maple (*Acer rubrum*) stump were unsuccessful, but in July, 1937, fruiting bodies of *Xylaria polymorpha* [*R.A.M.*, xii, p. 544] developed on the wood and a similar black zone was found in the adjacent wood, consisting of brown to nearly black, densely aggregated bladder cells occupying the lumina of the fibres and the wood ray cells. The first step in the formation of the black zone is the penetration of the tissue by numerous hyaline hyphae, which later swell and become closely septate. At some point beyond one edge of the zone bladder cell formation commences, and still further in the bladder cells apparently break down, exuding a pigment which stains the surrounding tissue. Finally the pigment dissolves, leaving only the broken bladder cells just outside the other edge of the zone until these in turn disappear. There is thus a progressive movement of the zone line, at any rate in nature. Campbell's theory that the zone line constitutes a 'pseudosclerotium' [ibid., xvi, p. 137] is considered to be more plausible than Hiley's hypothesis that the bladder cells represent enhanced metabolic activity on the part of the fungus (Fungal Diseases of the Common Larch, 1919). No difficulty was experienced in obtaining cultures of *X. polymorpha* from the wood bearing fructifications in 1937, and the failure of similar attempts in 1933 is tentatively attributed to staling, as observed by Brooks and Brenchley in connexion with *Stereum purpureum* infections enclosed by a gum barrier [ibid., x, p. 605].

Ogawa (T.). **Shoot drooping disease of Acer trifidum Hook. et Arn. caused by Pseudomonas acernea n.sp.**—*Ann. phytopath. Soc. Japan*, vii, 2, pp. 125–135, 4 figs., 1937. [Japanese, with English summary.]

Nursery and avenue maple (*Acer trifidum*) trees in Japan are stated to have been suffering for the past 25 years from an epidemic disease characterized by an irregular, water-soaked, later pale Payne's grey

or black spotting of the leaves, which finally turn black and shrivel. The organism isolated from the affected tissues is a rod with rounded ends, 0·5 to 1·2 by 0·2 to 0·6 μ, usually 0·8 by 0·4 μ, aërobic, uniflagellate, non-spore-forming, Gram- and aniline-positive, growing well on a number of standard media, liquefying gelatine, clearing but not coagulating milk, producing some acid but no gas from saccharose, lactose, maltose, dextrose, levulose, galactose, mannite, and glycerine, reducing nitrates to nitrites, and forming hydrogen sulphide. On poured plates of standard agar the colonies are round, smooth, white, glistening, with entire margins; on agar slants the white, filiform streak developing along the inoculated line in 24 hours at the optimum temperature of 32° C. turns citron-yellow in two days. The thermal death point of the organism, which is named *Pseudomonas acernea* n.sp. (group number Ps. 211.2223032), is 59°; all the bacteria on an agar plate were destroyed by 1¼ hours' exposure to mid-day sunlight in mid-November. A list is given of 13 other *A.* spp. infected by *P. acernea* in inoculation experiments, which were also positive on *Aesculus turbinata* and *Koelreuteria paniculata*.

Lohwag (K.). **Fomes hartigii (Allesch.) Sacc. et Trav. und Fomes robustus Karst.** [*Fomes hartigii* (Allesch.) Sacc. & Trav. and *Fomes robustus* Karst.]—*Ann. mycol., Berl.*, xxxv, 5–6, pp. 339–349, 2 figs., 1937.

In connexion with a study of the decay of firs (*Abies pectinata*) by *Fomes hartigii* [*R.A.M.*, xvii, p. 214] and of oaks (*Quercus sessiliflora*) by *F. robustus* [ibid., xvi, p. 221] in Austria, the writer investigated the differences between these two closely related species. *F. robustus* is confined to oaks and chestnuts, whereas *F. hartigii* has been found only on conifers (fir and spruce). The surface of the fruit bodies of both species is brown, but cracks usually develop in course of time on those of *F. robustus*, which are also generally larger than those of *F. hartigii*. Typical of the latter are the numerous superficial pits formed by the exudation of water drops, while the fruit bodies of *F. robustus* are characterized by a well-defined marginal ridge. Hymenial tube formation only commences at a relatively late stage in the development of *F. hartigii* and the individual layers are interspersed with fairly thick strata of tramae which are absent in *F. robustus*. The differential growth of these strata from base to periphery produces a marked difference in shape between the fruit bodies of the two species. *F. hartigii* adheres by its entire base to the substratum, to which *F. robustus*, on the other hand, is only lightly attached. Many of the features attributed by Hartig to *F. igniarius* [ibid., xvii, p. 214] are considered to be more typical of *F. robustus*, the former, for instance, being described as the most common agent of wood destruction on the oak, whereas neither the author nor Bourdot and Galzin (Hyménomycètes de France, 1927) have observed it on this host [but see *R.A.M.*, xv, p. 63].

Wean (R. E.). **The parasitism of Polyporus schweinitzii on seedling Pinus strobus.**—*Phytopathology*, xxvii, 12, pp. 1124–1142, 2 figs., 1937.

A physiological and pathological study was made of white pine

(*Pinus strobus*) seedlings inoculated with a pure culture of *Polyporus schweinitzii* [*R.A.M.*, xvi, p. 428] originating in a severely infected stand of the same host near Hemlock Lake, New York State. Young seedling growth was found to be adversely affected by a low phosphorus content of the synthetic nutrient solution, but not by a reduction of nitrate nitrogen. Calcium and phosphorus absorption was reduced at P_H 7 in both control and inoculated cultures. Relatively large amounts of calcium compounds were found in the immediate vicinity of the roots, together with a reduced calcium content in the plant ash, denoting that absorption of the element was prevented by the presence of the fungus, the hyphae of which were found penetrating directly through the living cortical cells of the root and through the corky excrescences at the lateral root bases. The pathogenicity of the fungus increased progressively with the alkalinity of the nutrient solution and with reduction in its phosphorus content. Root infection was accompanied by a reddening of the host tissue apparently associated with premature lignification and the development of an acid condition. The parasitism of living seedling roots by *P. schweinitzii* suggests the possible spread of the fungus by nursery stock to forest plantings and implicates it as a factor affecting the natural reproduction of susceptible hosts. In liquid malt cultures *P. schweinitzii* produces succinic acid in amounts capable of increasing the acidity of non-buffered solutions. In buffered solutions the optimum point for growth is P_H 4.

Baxter (D. V.). **Development and succession of forest fungi and diseases in forest plantation.**—*Circ. Univ. Mich. Sch. For. Conserv.* 1, 45 pp., 9 pl., 2 diags., 1 graph, 1937.

This survey of forest diseases in several plantations in Michigan includes the following interesting observations. Adverse site conditions or the attacks of one fungus may often result in a succession of diseases. Diseases favoured by site alone are generally more severe in pure stands than in mixed ones [cf. *R.A.M.*, xvii, p. 278]. Norway spruce (*Picea excelsa*) planted on 'worn out' farm soils in southern Michigan shows a very irregular rate of growth: the maximum and minimum heights in a 29-year-old pure spruce plantation in 1933 were 48·3 and 3 ft., respectively. Stunted trees often show symptoms of chlorosis, but recover eventually after the stand closes. Close spacing of the trees (3×3 ft.) in a pure stand favoured the early appearance of *Stereum sanguinolentum* [ibid., xvii, p. 86]; wider spacing prevented the development of a fungus mat caused by *Peniophora byssoidea*. Spruce planted with locust [*Robinia pseud-acacia*] exhibits a very rapid growth, leading to great injury or even total loss owing to the formation of deep frost cracks, which leave the heartwood open to infection by heart rot fungi, e.g., *P. gigantea* [ibid., xvii, p. 1].

White pine [*Pinus strobus*] planted on 'worn out' farm lands in southern Michigan, where there is an impervious layer of clay below the surface, is subject to root rot (*Polyporus schweinitzii*) [see preceding abstract] at an early age. Scots pine [*Pinus sylvestris*] is more readily attacked by the gall rust [? *Cronartium cerebrum*: ibid., xv, p. 331] when planted on the cut-over jack pine plains of the north of Michigan than in the hardwood belt of the south. *P. ponderosa*, lodgepole pine

[*P. contorta*], and Austrian pine [*P. nigra*] planted on the jack pine (*P. banksiana*) plains are so badly infected by *C. comptoniae* [ibid., xii, p. 543] that practically every tree is killed. Only young trees of *P. ponderosa* planted in southern Michigan were infected by *Coleosporium solidaginis* [ibid., xiv, p. 364]. Jack pine and Norway pine [*P. resinosa*] are likely to suffer longer from *Lophodermium pinastri* [ibid., xiv, p. 663] when planted on the northern plains than in the hardwood region. Canker of *P. resinosa* caused by *Tympanis pinastri* [ibid., xiv, p. 612] is reported for the first time in the Great Lakes region, where at least 86 per cent. of the trees in one stand were affected by it.

MIELKE (J. L.). **An example of the ability of Ribes lacustre to intensify Cronartium ribicola on Pinus monticola.**—*J. agric. Res.*, lv, 12, pp. 873–882, 1 map, 1 graph, 1937. [Issued 1938].

The results of a study over a number of years on the intensification of white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, xvii, p. 143] on a 45-acre plot of western white pine (*Pinus monticola*) near Revelstoke, British Columbia, where *Ribes lacustre* is the only species of *Ribes* present, indicated that this alternate host of the rust constitutes a far greater menace to *P. monticola* than was hitherto assumed. The eradication of *R. lacustre* from the neighbourhood of pine stands is therefore strongly advocated.

DAY (W. R.). **The dying of Larch: a note on Professor E. Münch's monograph 'Das Lärchensterben'.**—*Forestry*, xi, 2, pp. 109–116, 1937.

In this critical discussion of Münch's recently published papers on larch die-back [*R.A.M.*, xvi, p. 76; see also xvii, p. 214], usually associated in Germany with the cankers due to *Dasyscypha willkommii* (= *D. calycina*), the author states that there would appear to be no reason as yet for not accepting Langner's general conclusions that the fungus plays a secondary but definite and necessary part in the canker development [ibid., xv, p. 693]. The author's work in Britain has revealed such a close connexion between the development of small cankers four to five years of age and frosts occurring during the period of active metabolism, that there appears to be no doubt that in Britain at least frosts in late winter, spring, and autumn commonly initiate and continue canker development. Münch and his school bring the fungus too compulsorily into the continued growth of the cankers, and dismiss too lightly the point of view of those who associate susceptibility to disease with wrong treatment and wrong choice of habitat. While it is of fundamental importance to recognize the true cause of a die-back or canker, it is equally important to see that other conditions affect the growth and health of the tree and may markedly affect the tendency of the tree to succumb to or recover from frost injury, whether this is aggravated by fungus infection or not. The solution of the larch problem is to be sought by fitting race of tree to habitat, and in this connexion it is stated that the Scottish larch is well worth propagating in suitable localities in Britain.

GAISBERG (ELISABETH v.). **Die Adelopus-Nadelschütte der Douglasie dargestellt auf Grund der bisher hierüber erschienenen Untersuchungen.** [The *Adelopus* needle-fall of the Douglas Fir described on the basis of the studies hitherto published on it.]—*Biologe*, vi, 12, pp. 385–388, 1 fig., 1937.

This is an abridged account of the available knowledge concerning the needle-fall of Douglas firs (*Adelopus gäumanni*), with special reference to the writer's observations in Württemberg, Germany, together with a note on *Rhabdocline pseudotsugae* on the same host. Full particulars of the work have already been noticed from another source [*R.A.M.*, xvii, p. 84].

STORCH (K.). **Ueber den Abbau des Fichtenholzes durch den Rotfäulepilz (Polyporus annosus).** [The degradation of Spruce wood by the red rot fungus (*Polyporus annosus*).]—*Papierfabrikant*, xxxv, 49, pp. 485–492, 1 graph, 1937.

The author describes and tabulates the results of his analytical examination of samples of 60- to 120-year-old spruce wood from various parts of Germany and discusses the data in respect of degradation by *Polyporus* [*Fomes*] *annosus* [see above, p. 282] in the light of contemporary studies. The fungus renders the wood soluble in 15 per cent. sodium hydroxide, solubility increasing parallel with advancing disintegration. Chemically the decayed wood is very similar to sound material. Both lignin and carbohydrates are destroyed by the fungus, the mycelium of which was found to contain an abnormally high proportion (24 per cent.) of extractives as compared with the xylem (2 per cent.). Degradation of the cellulose is probably effected by depolymerization in Staudinger's sense (*Zellstofffaser*, xxxiii, p. 153, 1936), involving the gradual disappearance of the high molecular components and a consequent reduction not only in the yield but in the quality of the fibre.

WATERSTON (J. M.). **Cedar disease survey. General review of diseases and pests.**—*Agric. Bull. Bermuda*, xvi, 10, pp. 50–55, 1937.

Cedars (*Juniperus bermudiana*) in Bermuda are affected by a dry heart rot caused by a fungus as yet unidentified, which enters the tree through an old wound, and spreads longitudinally and radially in the heartwood as white, papery sheets which later turn dark buff. The diseased wood is darker brown than the rest of the heartwood, and tends to crack at right angles to the grain, as a result of which it finally splits into small rectangular pieces which lie loosely in the central cavity. In many cases the damage remains unseen until the tree is cut up. Trees 50 to 250 years old are affected, and apparently the disease is commonest on trees the felling of which has been unduly delayed. The affected trees lose their commercial value and are readily blown down. The condition is controlled by the usual surgical methods.

The same host is also attacked by rust (*Gymnosporangium bermudianum*) [*R.A.M.*, xv, p. 412], and the pathogenicity of a species of *Pestalozzia* and of one of *Phomopsis* found on dead and dying branches [ibid., xv, p. 413] is under observation.

Bongini (Virginia). **Seccume della Cryptomeria. (Nota preliminare.)** [Desiccation of *Cryptomeria*. (Preliminary note.)]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xiv, 1–4, pp. 19–31, 2 pl., 4 graphs, 1937.

A brief account is given of a serious outbreak of a disease in young rooted cuttings of *Cryptomeria japonica* var. *elegans* which was first noticed during the winter of 1935–6 in municipal nurseries in Turin and which by October, 1936, had spread to and killed several hundred of the cuttings. Other species of *Cryptomeria* growing in close proximity to the diseased plants also showed signs of infection in 1937. The main symptoms are the yellowing and partial desiccation of the needles, starting either from the tip or from the base, partial drying-up from the base upwards of the primary ramifications arising in the leaf axils, and yellowing and total desiccation of the secondary branches lower down on the main stem; the drying-up process may eventually reach the top parts of the plant, and result in its death. Diseased cuttings showed the constant presence of a species of *Cladosporium* which is referred to *C. laricis* [*R.A.M.*, ii, p. 297] and of polymorphous pycnidia referable to the genus *Phomopsis*, suggesting a genetic connexion between the two organisms. While the evidence would indicate that the condition is caused by one or both of these fungi, attempts to reproduce it experimentally have so far given negative results.

Cartwright (K. St. G.). **Timber-stain in Norway Spruce.**—*Forestry*, xi, 2, p. 124, 1 pl., 1937.

With reference to a statement by H. Meyer-Wegelin in his work 'Ästung' (see *Forestry*, xi, 1, p. 59, 1937) that the live pruning of Norway spruce [*Picea excelsa*] is often followed by decay, the author points out that he has frequently observed red stain followed by white rot in Norway spruce poles due to *Stereum sanguinolentum* [see above, p. 359], there being strong evidence that infection had occurred in the standing tree. Since many species of *Stereum* attacking the wood of the living tree effect their entry through broken branches, the author considers it highly probable that the decay referred to by Meyer-Wegelin may be largely due to *S. sanguinolentum*.

Robertson (W. A.). **Report of the Director of Forest Products Research for the year 1936.**—*Rep. For. Prod. Res. Bd, Lond., 1936*, pp. 3–57, 4 pl., 7 graphs, 1937.

The following are among the items of phytopathological interest occurring in this report [cf. *R.A.M.*, xvi, p. 290]. The collection of fungi maintained in pure culture at the Forest Products Research laboratory now includes 235 species of wood-destroying fungi as well as a number of staining organisms.

The computations involved in the treatment of 4,400 railway sleepers [ibid., xv, p. 185] have now been completed. Baltic redwood [*Picea excelsa*] sleepers are generally creosoted by a full cell process, but a much better distribution results from injection by the empty cell process, by which the sapwood can be completely impregnated without being saturated, while at the same time the treatment can be continued until the heartwood faces of the sleepers are sufficiently

penetrated. An even deeper and more uniform penetration of the heartwood results if the faces are incised. The more uniform absorption obtained by the empty cell method reduces the number of imperfectly impregnated sleepers and hence the cost of track maintenance.

Confirmatory tests on the impregnation of Douglas fir [*Pseudotsuga taxifolia*] sleepers demonstrated that sleepers treated on arrival, at a moisture content of 27 per cent., absorbed 33 per cent. more creosote than similar sleepers seasoned for 9 months to a moisture content of 20 per cent. It appears that the moisture content of the surface of the timber becomes much more important than the average value for the whole sleeper, and that when the surface has dried much below 25 per cent. moisture content the penetration of the creosote may be retarded. Irregular penetration of creosote in New Zealand beech (*Nothofagus menziesii*) was ascertained to be due to the localized development of tyloses and gum-plugging of the pores.

The results of periodic examination of experimentally treated fence posts erected in 1932 indicated that charring the posts has very little preservative effect, though if the charred posts are dipped in creosote the preservative effect is greatly increased; tarring appeared to be of little value.

Zinc oxide paints were less liable to mould than white lead paints [ibid., xvi, p. 291; xvii, p. 195]. A simple method was devised of testing the fungicidal efficiency of paints, the fungus being cultivated on wood pulp mats soaked in malt extract, and the paint applied to the mats when these were covered with the mould; observations were then made on the ability of the fungus to penetrate the paint.

A study of the conditions influencing the fructification of Basidiomycetes in culture showed that an agar containing 2 per cent. dextrose and 1 per cent. peptone was a very satisfactory medium. Some species grew on media containing up to 10 per cent. peptone. Sterilized wheat or oat grains soaked and allowed to germinate before autoclaving gave vigorous growth and well-developed fructifications. The general conclusion reached is that some species, e.g., *Collybia velutipes*, *Schizophyllum commune*, and *Armillaria mucida*, form fruit bodies on almost any medium, whereas others, e.g., *A. mellea* and many species of *Fomes*, remain sterile on all media. For some species the optimum length of daily exposure to light for vegetative growth and fructification depended on the concentration of nutrients in the medium. Some fungi are extremely sensitive even to very brief exposure to subdued light. Decay of a floor was reported as due to *Fomes roseus* [ibid., xvi, p. 646], which is uncommon in England, and was probably present in the timber when it was imported.

Deterioration of timber caused by fungi. Part 2. Staining fungi.—*Tradè Circ. For. Prod. Aust.* 38, 10 pp., 4 figs., 1936. [Received December, 1937.]

The commonest sap stain of timber in Australia is the blue stain of the sapwood of pines [*Pinus* spp.] caused by several species of *Ceratostomella*. A deep yellow stain of the sapwood, probably caused by a mould, is somewhat common in some of the light-coloured kinds of *Eucalyptus*; generally found in fire-killed trees felled about two years

after death, it also occurs in trees injured in other ways. Australian hardwoods are also subject to yellow staining caused by *Penicillium divaricatum* [*Paecilomyces varioti*: *R.A.M.*, xvi, p. 575]. Staining organisms do not develop in wood with a moisture content of less than approximately 20 per cent., and their growth becomes progressively slower at temperatures above 85° and below 75° F. The paper concludes with recommendations for prevention and control by rapid drying and chemical treatments, respectively.

Reinking (O. A.) & Humphrey (C. J.). **Some fungi found decaying railway ties of native woods in Honduras.**—*Plant Dis. Reptr*, xxi, 20, pp. 357–359, 1937. [Mimeographed.]

A list is given of 22 different fungi belonging to 4 families (mostly Polyporaceae) found in 1922 and 1934 near Tela, Honduras, causing decay of railway sleepers made of native woods.

Chupp (C.). **The effect of temperature and moisture on vegetable diseases in New York State in 1937.**—*Plant Dis. Reptr*, xxi, 17, p. 320, 1937. [Mimeographed.]

During August, 1937, the weather in New York state was hotter and wetter than ever previously recorded, and the following observations *inter alia* were made on its effect on disease. Though heavy rain usually favours cucurbit infection by *Cladosporium cucumerinum* [*R.A.M.*, xvi, p. 655], the fungus had not been found by September, probably owing to the heat. *Phytophthora infestans* began to cause widespread infection of potatoes and tomatoes, but high temperatures at night checked the disease, except in the extreme north. There was no record of [tomato] spotted wilt affecting pepper [*Capsicum annuum*] anywhere in the state, although in 1936 California Wonder peppers showed almost 100 per cent. infection [cf. ibid., xv, p. 65]. Celery was severely affected by *Cercospora apii* [ibid., xvi, p. 584] in fields where dusting or spraying had been neglected; less blight (*Septoria* spp.) [*S. apii*: loc. cit.] was, however, present than usual. Muskmelons were everywhere affected by *S. cucurbitacearum* [ibid., xi, pp. 159, 745], though the disease is generally rare, and were also attacked much more severely than usual by *Alternaria cucumerina* [ibid., xiv, p. 182].

Kadow (K. J.) & Anderson (H. W.). **Damping-off control: an evaluation of seed and soil treatments.**—*Bull. Ill. agric. Exp. Sta.* 439, pp. 291–384, 9 figs., 1937.

Field and greenhouse studies [which are fully described, and the results of which are tabulated] carried out in Illinois from 1932 to 1936, inclusive, on the control of damping-off of vegetable seedlings [*R.A.M.*, xvi, p. 659] showed that about 80 per cent. of the local infections are due to *Pythium* species, and 15 per cent. to *Rhizoctonia* [*Corticium*] species, while in a few cases the disease is due to *Botrytis* or *Fusarium* spp.

The chief variables affecting the pre-emergence phase (much more serious than the post-emergence phase) were soil moisture and tempera-

ture. High humidity and high temperature were the main factors during post-emergence, though soil moisture was also important.

Of the treatments tested, cuprous oxide was very injurious in soils of P_H over 5, though soil acidity had no effect on control by semesan or vasco 4 under similar conditions. Heavy rains after planting reduced the value of semesan as a seed treatment. Colour was a less accurate indication of the fungicidal efficiency of the different cuprous oxides than copper content and adhesiveness.

In limited tests on spinach [ibid., xvii, p. 219] cuprocide, semesan, and vasco 4 gave better control when the disease was due to *Corticium* than when it was caused by *Pythium*; in either case, effectiveness decreased in the above order. No seed treatment gave effective control in a susceptible crop under conditions highly favourable to infection, but under ordinary growing conditions seed treatment was as effective as soil sterilization. Under the experimental conditions, the following treatments (arranged in descending order of effectiveness) gave satisfactory control for lettuce, endive, carrots, beet, Swiss chard [*Beta vulgaris* var. *cicla*], muskmelon, watermelon, cucumber, tomato, pepper, and egg-plant, viz., cuprous oxide, copper sulphate soak, and semesan (the last for crops under glass and watered lightly); for squash copper sulphate soak and cuprous oxide; for cabbage, kale, and kohlrabi zinc oxide (specially prepared for seed treatments, as in vasco 4, leafox, or AAZ Special), or semesan (better than the foregoing for crops under glass, and watered lightly); for peas cuprous oxide; for spinach cuprous oxide, zinc oxide (as above), copper sulphate soak, or semesan (for crops under glass, watered lightly). No treatments are recommended for beans, leeks, onions, or parsnips, and treatments for radishes and turnips are of doubtful value.

The post-emergence phase may be controlled by two or three applications of Bordeaux mixture at three-day intervals.

Recommendations are briefly given as to suitable cultural practices, and the paper concludes with a list of the precautions to be adopted in utilizing the control measures described.

[The practical recommendations given in this paper are embodied in *Circ. Ill. agric. Exp. Sta.* 481, 1937.]

SINGALOVSKY (Z.). **Étude morphologique, cytologique et biologique du mildiou de la Betterave (Peronospora schachtii Fuckel).** [A morphological, cytological, and biological study of Beetroot mildew (*Peronospora schachtii* Fuckel).]—Thèses, Fac. Sci. Univ. Paris, Sér. A, 358, pp. 552–618, 40 figs., 7 graphs, 1937.

This is an exhaustive study [described in detail] of the morphology, cytology, and biology of beet downy mildew (*Peronospora schachtii*) [*R.A.M.*, xi, p. 419; xv, p. 764]. The author found that the mycelium can invade the entire plant, including the whole root and the perivascular cells, and was occasionally present in the vessels. The thickening of the infected leaves results from cellular hypertrophy rather than hyperplasia, and this hypertrophy is more marked in the cells of the spongy mesophyll than in those of the palisade tissue. The histological changes induced did not vary greatly with the different species and varieties of beets examined. The affected leaves show marked reduction

in chlorophyll pigments, but only small cytological differences were observed between healthy and infected cells. In the latter the starch content of the chloroplasts was greatly reduced.

Conidial germination takes place at temperatures ranging from 0·5 to 28°–29° C., and reaches its optimum (72 per cent. germination at the end of six hours) at about 10°.

In artificial inoculations in the field the incubation period was about nine days, and the evidence obtained showed that susceptibility depended mainly on the plants being in an early stage of development when exposed to infection, temperature being only of secondary importance unless very high or very low. Field observations over a period of 18 months showed that new invasions occurred only between 5° and 20°.

The amount of damage caused by the disease also depends on the stage of development reached by the plant when infected, late infections inducing sterility of the flowers. In a test in which a large number of commercial varieties were exposed to natural and artificial infection, only two failed to take the disease, viz., the so-called 'Rouge demi-longue à feuillage noir' and Yellow Tankard. The wild species *Beta maritima* showed nearly 40 per cent. natural infection.

BUCHHOLTZ (W. F.). **A severe case of Rhizoctonia root rot of Sugar Beets after Potatoes.**—*Phytopathology*, xxvii, 12, p. 1180, 1 fig., 1937.

A severe case of late canker root rot of sugar beets grown in an area at Kanawha, Iowa, occupied by potatoes in 1934 was observed in 1935. Adjoining the potatoes had been a barley field, some of which was also covered by the beets, but here there was scarcely any rot (1·6 as compared with 50 per cent. on the potato ground). The only fungus isolated from decayed beets was *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvii, p. 153].

PALM (B. T.). **The 'cracked skin' disease of the Beet (Beta vulgaris L.).** —*Svensk bot. Tidskr.*, xxxi, 5, pp. 395–399, 1 fig., 1937.

During the harvest seasons of 1934 and 1935 the writer examined a large number of abnormally small, dark brown to black beets, the cortex of which, especially near the crown, bore cracks running downwards parallel to the main axis of the root. No pathogenic organism was isolated from the diseased material. A survey of fodder beet fields led to the detection of a similarly affected plant with erect, brittle, exceptionally narrow leaves, tapering towards the petiole, while the older foliage showed numerous coal-black, necrotic, irregularly distributed lesions. Presumably these foliar symptoms were causally connected with the cracked surface of the roots. On drying, the affected leaves turned coal-black instead of the normal light brown. The disorder appears to be very uncommon in Sweden, but an identical or closely similar trouble has been observed at the Kleinwanzleben (Germany) Sugar Beet Experiment Station. The 'cracked skin' disease of beets presents many analogies with dahlia stunt [*R.A.M.*, xvii, p. 114], both being in all probability of virus origin.

PANASSYUK (M. P.). Основные выводы научно-исследовательских работ ВНИС'а за 1936 год. [Main results of the scientific research work during 1936 of the Pan-Soviet Scientific Research Institute for the Sugar Industry.]—285 pp., 38 figs., 6 graphs, Держ. Видавн. Колгос. і Радгос. Літер. УССР. [Ukr. Publ. Off. Collect. & Co-op. Fmg Lit.], Kieff, 1937.

This is a collection of summarized reports of officers of the Scientific Research Institute for the Sugar Industry in the Ukraine of the results obtained in 1936 in the investigations on the more outstanding agricultural and technical problems of the industry. The following items are of phytopathological interest. According to E. F. Zaparenko (pp. 131–132), *Cercospora* [*beticola*] on sugar beet was more severe in 1936 than in 1935, especially in districts where high air temperatures coincided with relatively heavy rainfall during the critical period for infection; hot and dry conditions had a marked controlling effect on the disease, but artificial irrigation of the fields tended to increase the incidence and intensity. All the evidence indicated that the severity of the outbreaks was not related to the amount of leaf spot present in the locality in the preceding year, but to temperature and moisture which are apparently the decisive factors. Mme N. I. Salunskaya (pp. 133–134) states that laboratory and field tests during two years showed that various forms of sulphur and polysulphides gave no appreciable control of *C. beticola*; very adequate control, on the other hand, resulting in an increase of 8 to 20 per cent. in yield of sugar, was afforded by three or four timely applications of 1 per cent. Bordeaux mixture at the rate of 600 to 800 l. per hect., or three or four dustings with copper meritol at the rate of 20 kg., or copper-lime dust at the rate of 40 kg. per hect. Very promising results were also obtained with 1 per cent. emulsions of naphtha by-products containing 1·5 to 2 per cent. copper. The results of preliminary tests indicated that in certain localities the severity of *C. beticola* outbreaks was considerably reduced by applications of nitrogen and potassium to the beet seedlings at the two- and six-leaf stages; the effect of the fertilizers was greatest when they were applied in liquid form. Z. A. Pozhar (pp. 134–135) found in greenhouse experiments that the length of the incubation period of *C. beticola* was largely determined by temperature; it was shortest (9 days) at temperatures averaging 17·8° C., with a night minimum not below 10° and a day maximum not above 30°; at average temperatures of 16·1°, 19°, and 26° the incubation period was 13, 10, and 15 days, respectively. Air humidity had no effect on the incubation period, but was the decisive factor in determining the intensity of attack; in beet plants kept at 60 per cent. relative humidity, infection with *C. beticola* resulted in the formation of only 5 leaf spots per plant on the sixth day from inoculation, while in plants kept at 91 to 100 per cent. relative humidity the corresponding number of spots was 3,515. In leaves inoculated when physiologically mature, the incubation period was from one to six days shorter than in leaves inoculated at younger stages of development.

According to Mme Salunskaya, N. I. Gomolyako, T. D. Logvinenko, and A. I. Nassonoff (p. 136) effective control of *Rhizoctonia* root rot was afforded by steeping the beetroots before planting for seed

production in 1 in 300 commercial formalin and keeping them covered for two hours, or by dipping them for 5 minutes in 1 in 10 lime-sulphur or 0·25 per cent. germisan; all the other fungicides tested were either ineffective or injurious to the hosts. The causal fungus was found in the field on the weeds *Cirsium arvense*, *Solanum nigrum*, and *Capsella bursa-pastoris*.

O. I. Kotchura and T. D. Logvinenko (pp. 136–137) distinguish two types of sugar beet scab, namely, 'pimply scab' caused by bacteria, which is being studied, and the 'zonal or common scab', the causal organisms of which have been identified as *Actinomyces scabies* [*R.A.M.*, xiv, p. 340], *A. nigrificans*, and *A. cretaceus*. The second type is fairly widespread, especially in the beet-growing districts to the east from the Dnieper. Dressing heavily infected soil with sulphur at various rates or with 8 metric tons of lime per hect. had no appreciable controlling effect on the common scab, but in a few cases calcium cyanamide at the rate of 400 kg. per hect. reduced the incidence of the disease by about 15 per cent.

K. I. Vitas (pp. 137–138) states that he succeeded in obtaining pure cultures of *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., vi, p. 756 *et passim*] by transferring young, heavily tomentose 'infection cushions' [loc. cit.] from infected beetroots to various media, among which beer wort agar and beer wort meat agar were very favourable to the growth of the fungus. T. P. Odaritch (p. 138) states that while negative results were obtained from attempts to immunize sugar beets against *C. beticola* and seedling root rots by Arnaudi's and Carbone's methods [ibid., xiii, p. 318; xvii, p. 55], vaccination of the roots with filtrates from attenuated cultures of *Fusarium culmorum* reduced the storage rot caused by this fungus by 31·44 per cent. S. F. Morotchkovski (pp. 139–140) gives a list of 26 species or varieties of *Fusarium* which were isolated from beetroots stored in silos, eleven of which are stated to be new records on this host; the pathogenicity of the following to stored beets was experimentally established, namely, *F. culmorum* [ibid., xv, p. 765], *F. oxysporum* var. *aurantiacum*, *F. oxysporum*, *F. beticola*, *F. coeruleum*, *F. angustum*, and *F. bulbigenum* var. *blasticola*. A list is also given of 24 species of *Penicillium* [including five species named as new to science by the author, without Latin diagnoses] which have been found causing rots in stored beetroots, and of these *P. expansum*, *P. stoloniferum*, *P. rubrum*, and *P. bordzilowskii* n.sp. were shown to be the more active pathogens. Investigations in western Siberia showed that beet seedling root rot there is associated with 15 species of fungi, which are listed, including *Phoma betae*, *Alternaria tenuis*, and various moulds, among which *Acrothecium* sp., *Actinomucor repens*, and *Zygorrhynchus moelleri* are stated to be new records on beet.

Service and regulatory announcements. July–September 1937.—*S.R.A.*, *B.E.P.Q.* 132, pp. 230–253, U.S. Dep. Agric., 1937.

Summaries are given of the plant quarantine import restrictions in force in New Zealand, Presidency of Dominica, Dominican Republic, France, Germany, the Gambia, St. Vincent, Yugoslavia, Turkey, Tanganyika, Surinam, Nigeria, Bermuda, Nyasaland, China, and the Federated Malay States.